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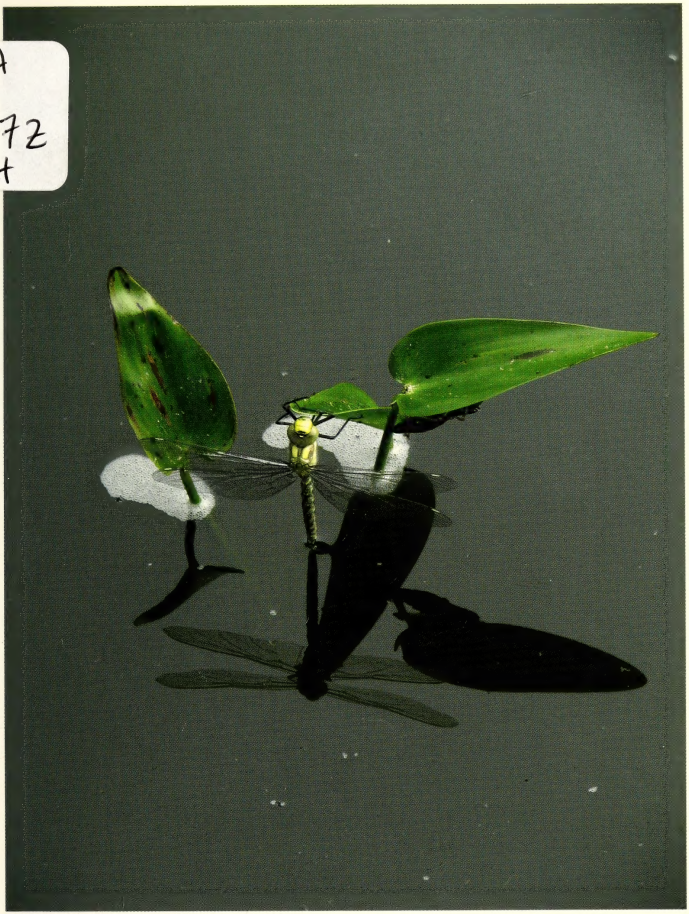

Nature in Avon

Volume 69

Bristol Naturalists' Society

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Besides many general indoor and outdoor meetings and excursions, others are specifically devoted to geology, plants, birds, mammals and invertebrates. Members may use the Society's large library..

Further information is available on the Society's website

Front Cover. The plant is Pickerel, *Pontederia cordata*, a New World pond species. The dragonfly is a Southern Hawker *Aeshna cyanea*. Roger Symes

Editorial

It is a great privilege to be the Editor of this journal as the variety of papers, the knowledge that they reveal, and the hours of research that go into them, never cease to amaze me. Pond life is a popular synonym for the lowly and boring, and how wrong that perception is is made obvious by Hazel Willmotts masterly summary of a thesis. There is a fine second article on the amphibians of the four ponds at Folly Farm. I have summarised another thesis, by Lorna Shaw, who worked for three years on the Bristol House Sparrow population and demonstrated that the skewed density structure which the Bristol Birdwatch scheme first demonstrated in 2000 is a national phenomenon. Yet more of the history of the background to the origins of the society, and its links to natural history nationally, is provided by Clive Lovatt's essay on Thwaites and the Bristol Microscopical Society, whose minutes have just been deposited with the City Archives.

Two articles on local wildlife areas within the city by John Burton demonstrate the importance of recording, and of publishing records. It is vital that there is support for the Bristol, Environmental Records Centre with its sophisticated storage and retrieval devices, as these are accessed by decision makers of many kinds, but it is no less important that local green spaces, many under threat from the new planning strategy imposed by the last government, are publicly reorded and monitored by local people.

The article on Honorary Fish is a fine piece of historical research linking the wildlife of the past with that of the present. A notable publication this year has been the detailed description of the 51 known species of Whitebeam by Tim Rich and Libby Houston, issued as a BSBI handbook, though one that is probably out of date already, such is the speed with which new species are being defined, and it is reviewed. I regret that complications have prevented the Botany report for 2009 appearing in this issue.

For almost 150 years the society has recorded and monitored the changing nature of the wildlife upon which we depend. Adaptation to a continually changing environment is the fundamental basis of the interactive world of which we are a small part, and we are both affected by and affect all the other wonderful and astonishing structures that all have their complex role to play. "Mankind cannot stand much reality" said TS Eliot, but it remains our role to provide as much knowledge and understanding as we can. There is a list of regional Recorders for a variety of groups on page 113.

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Weather report for 2009

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2009 was again the coldest year since 1996, but its temperature was almost exactly the same as the average since 1853. It began with a cold winter, the coldest since 1996, an average spring, a second cold summer and a warm autumn. Rainfall was exceptional in July, and November equalled the record for the wettest November in 1929, and also for the wettest month since 1853. Overall rainfall was 986mm compared with the average since 1853 of 895mm.

Year	2000	01	02	03	04	05	06	07	08	2009
Avg Max	14.1	13.8	14.3	15.0	14.3	14.4	14.7	14.5	13.7	13.6
10 year	13.8	13.8	14.0	14.2	14.3	14.2	14.4	14.4	14.3	14.2
Rainfall	1250	860	1178	758	951	896	955	1107	1150	981
10 year	1003	995	1010	978	970	954	973	997	1005	986

Table 1 Decadal average mean maximum temperature and rainfall

Seasons. The average for the winter (Dec.-Feb.) was 6.4ºC, the coldest since 1995/96. Rainfall, at 65mm a winter month, was below average. There were 49 frost nights (October to April), the last on March 5th. There were 23 nights cold enough to create ice, and twelve days with snow lying. The coldest spell was of 14 days below 5ºC from Dec. 27th to Jan. 10th, followed by ten days from Feb. 1-9th.
Spring. (March-May) Average temperature was 13.6ºC, a little above the long term average of 12.9ºC. Rainfall at 47mm a month was drier than average.
Summer. (June-Aug.) Average temperature, at 19.8ºC, was very close to the long-term average. However it was again a wet summer, and July was the wettest since 1940, pushing the summer average per month to 101mm, actually identical to 2008.
Autumn. (Sept.-Nov.) at 14.9ºC was warmer than average, and September was unusually dry, but the record rain in November made up for this.

Seasonal Comparisons. To put the 2008 seasonal average temperatures into perspective, Table 2 shows the seasonal temperature extremes, with their year, and the average since 1853.

	2009	Min	Max	Avg
Winter	6.4	1917 2.5	1920 10.6	7.4
Spring	13.6	1887 10.4	1893 16.6	12.9
Summer	19.8	1883 18.0	1976 23.9	20.2
Autumn	14.9	1915 10.6	1959 16.8	14.0
Annual	13.6	1892 12.1	1921 15.6	13.6

Table 2 2009 seasonal average temperature compared with minimum, maximum and average since 1853.

	2009	Min	Max	Avg
Winter	65	1964 21	1995 154	78
Spring	47	1893 17	1981 107	60
Summer	101	1995 11	1879 140	73
Autumn	112	1978 26	1935 173	87
Annual	1150	1864 590	1882 1253	894

Table 3 Average monthly rainfall in mm for each season in 2009 compared with maximum, minimum and average since 1853.

Monthly deviation from the average since 1853.

Temperature. January and December were much colder than normal, all other months were very close to average.

Rainfall. Seven months were below average, particularly September, but this was made up by spectacular downpours in July and November.

	Temp	Rain		Temp	Rain
Jan	-20	8	Jul	-7	168
Feb	-8	-16	Aug	-3	-42
Mar	9	-22	Sep	1	-73
Apr	8	-25	Oct	8	-34
May	-1	-10	Nov	11	190
Jun	5	0	Dec	-29	2

Table 4 Monthly percentage deviation from norm

Monthly summary 2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
Temp C°	5.8	7	10.9	13.8	16.1	20.2	19.4	19.7	18.1	15.2	11.3	5.6	13.6
Rain mm	91	52	47	43	56	62	193	49	21	63	252	57	986

Table 4 2009 Monthly average temperatures and total rainfall.

January. 5.8C°, the coldest since 1997. Rainfall, 91mm, was average. 15 frost nights. The first 12 days were dominated by east winds and high pressure, then SW winds around Icelandic lows took over. A storm on 17th felled a few trees.

February. 7.0C°, just below the average of 7.6C. Rainfall 52mm, a little below the 62mm average, much of it falling as snow, which lay for 13 days from 3rd to 15th, the longest since 1985/86. There were 10 frost nights, and 15 sunless days. The month was dominated by high pressure, but in the first half the winds were from the north or east, and in the second from the west.

March. 10.9C°, a degree above average, with three frost nights. Rainfall was below average at 47mm, all in six days. The first half was dominated by west winds, the second by high pressure and east or northerly winds.

April. 13.8C°, a degree above average, and two frost nights. Rainfall 38mm. Dominated by high pressure over the Baltic or Iceland giving north or easterly winds. Temperature peaked at 18C on 20th and 24th.

May. 16.1C°, close to average. Rainfall 56mm, a little below average. Dominated by low pressure and light westerly winds for three weeks, and the last week saw high pressure push temperatures up to 24C at the end of the month.

June. 20.2C, a degree above average. Rainfall 62mm, average. The first and last weeks were hot with easterly winds, and in between a long dry period with westerly winds and lower temperatures. Almost all the rain fell in two days in the first week.

July. 19.4 C, a degree below average, and colder than June. Rainfall 193mm, almost all in the last two weeks, the second wettest (to 1940) since 1853. Dominated throughout by westerly winds and low pressure systems.

August. 19.7C°, a little below average. Rainfall was 49mm, well below the 85mm average. Generally a dull month with light south or west winds.

September. 18.1C°, rainfall 21mm. By the end of the month there had been seven almost rainless weeks, which began to affect vegetation. Dominated by high pressure and east or northerly winds.

October 15.2C°, a degree above average, rainfall 63mm, Low pressure dominated for the first week and last ten days, and the middle saw high pressure and easterly winds, and the temperature falling to 12C on 15th.

November. 11.3C°, close to the average, rainfall 252mm, equaling the previous record set in 1929. Also the equal wettest single month since 1853. Only eight days had no rain. No frost nights. Dominated by low pressure and westerly winds. Temperature fell to 7C briefly on 9th.

December. 5.6 C°, coldest since 1996, rainfall 90mm, close to average. Snow fell on 21st and lasted for six days. 12 frost nights. Temperature fell abruptly on 11th, and remained low with north or east winds and high pressure over the UK or Greenland.

Weather Extremes.

The table below gives figures for extreme annual events over the past decade, enabling the extreme events of 2009 to be put in perspective. There seems to be no pattern in these figures, except for the number of days without any sun to increase from around 50 to around 100. It is also interesting that, contrary to common perception, two days in every three have no rain at all.

		00	01	02	03	04	05	06	07	08	09
Hottest day	c	30	30	26	32	28	30	35	27	28	28
Coldest day	c	3	2	0	1	3	0	0	2	2	-1
Wettest day	mm	55	55	60	45	45	47	39	40	35	36
Sunniest day	hr	15.5	14	14.9	15.1	13.9	14.8	14.7	14.1	14.9	14.7
Longest dry	days						14	22	24	16	20
Longest wet	days						7	11	8	8	8
Frost, nights	days	28	46	14	49	30	32	33	25	44	42
Snow	days	4	0	0	0	6	2	2	2	1	19
Storms	days						1	3	6	4	1
Hotter than 25C	days	12	15	3	22	13	14	27	1	7	5
Colder than 5C	days	13	34	17	25	15	26	39	18	14	37
More than 10hr sun	days	32	45	30	42	19	38	36	45	29	49
No sun	days	51	62	78	56	90	89	107	99	95	95
No Rain	days				263	231	248	234	238	228	265

Climate Change in Clifton- Miss Roger's Legacy

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Margaret Rogers did not just leave us her collection of first editions of the New Naturalists series, she also left us her five year diaries. These began in 1948, when she was a young Biology teacher at Clifton High School, and continued for 54 years until 2002. She lived in Clifton throughout this time, for much of it in Vyvyan House at the end of Vyvyan Terrace, Each volume covers five years, with single page for each date of the five years, and thus enables a ready comparison between the events of one year and another.

In these diaries she kept a record of the daily weather, of her visits to friends in a number of cars, each with a name, of events in her garden, and especially of the first time she saw wild plants in flower in the spring. She was not totally consistent in this; after she retired she travelled very widely around the world, which created gaps, and she seems to have been unaware that Gilbert White had established a calendar of natural events which many others had copied, leading to the creation of "phenology", the study of when natural events happen. In the early 20th century there was a national phenology organisation, run by the Meteorological Office, which tried to measure the pattern of events and their relation to the weather, but this was regrettably abandoned in 1947 as, in the absence of computers to handle the data, significant patterns were hard to detect.

Miss Rogers dates of species first flowering in Clifton can be compared with the known temperature, and with data that I have been collecting of the same events on the Downs for the past decade. For phenological data to be of much use it is important that the same observer records the same event at the same site every year, and one of the problems with the national scheme had been the lack of observational rigour to ensure that changes recorded were the result of the reaction of a plant to the temperature rather than to one of a number of other factors. A further problem with phenological data is that too often the dates recorded are not the dates when the species came into flower, but the date of when the observer happened to visit, which is not the same thing at all. To capture the moment a flower opens you have to observe it when it is not open, and because of this garden observations are often the most accurate. These suffer from the fact that not all species in a garden are wild, and that gardens benefit from the urban heat island, and possibly from the effect of street lamps, and the closeness of the garden to the house.

The plant species she recorded most often were the four spring species, Snowdrop, Daffodil, Celandine, and Hazel. Almost all the records come from Clifton, many from her own garden, and they are the species that are most sensitive to early spring temperature, and hence can tell us the most about the reaction of plants to

climate change in this period, when it is diaries such as hers that are the sole evidence.

During this period winter temperature, (that is the average of December, January and February), in Bristol averaged 7.7°C, slightly warmer than the average since 1853 of 7.5°C, and as Chart 1 shows, there was no detectable trend. The range was from 2.8°C in 1963 to 10.1°C in 1989, a range of 7.3°C. There were 14 winters below 7.0°C, and 11 winters with an average of 9.0°C and above. Another way of putting that is to say that there was a cold winter on average every 4.4 years and a warm one every 5.6 years.

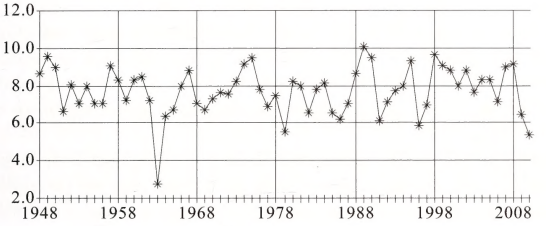

Chart 1 Winter Temperature in Bristol 1948-2010

Winter climate figures, that is a thirty-year rolling average, increased from 6.5°C in 1880 to 8.0°C by 1940, but between 1948 and 2010 it altered little, fluctuating between 7.5°C and 8.0°C.

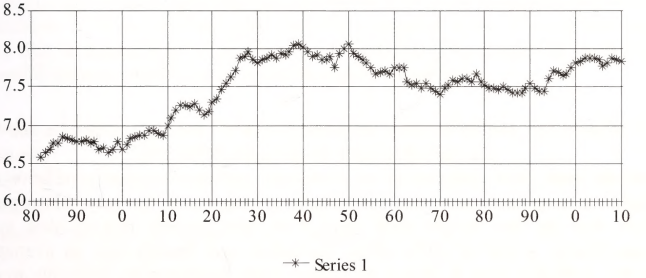

Chart 2 Rolling 30 year average winter temperature, 1880-2010

The average first flower date, and the extremes, are shown in the table below. Snowdrop was usually the first on Jan 21st, followed by Hazel on 24th, and then Celandine on Feb 20th and Daffodil on March 4th. In the table dates are given in days after January 1st. What is striking is that all four species have a huge range of first dates, the least being Snowdrop with a 60 day, (two month), range, and the most daffodil with 95 days (three months). This demonstrates how very sensitive to temperature these species are, and suggests an average change of 11 days for each degree change of temperature.

Rogers	Number of years	Earliest date	Latest date	Average date	Range
Snowdrop	38	5	55	21	60
Hazel	23	-12	70	24	82
Celandine	34	5	94	51	89
Daffodil	22	12	107	64	95
Average				40	82

Table 1 Four spring species first flowering dates 1948-2002.

There were just ten winters when Miss Rogers recorded all of Snowdrop, Hazel and Celandine, and the dates show a nice correlation with the December/January temperature. Roughly speaking a one degree change in temperature saw a seven day change in date.

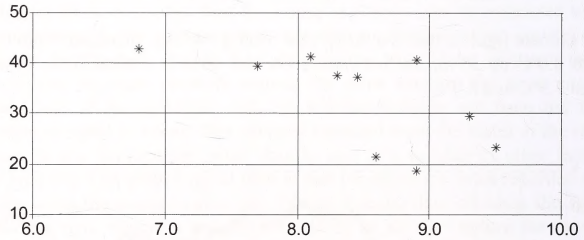

Chart3 Correlation between the average date of three spring species and December/January temperature, 1948-2002

Daffodil dates were collected on 21 occasions, and show a good correlation with whole winter temperatures. It is particularly striking that in the very cold winter of 1963 they did not flower until April 17th, and equally striking that in the extraordinary winter of 1975, when December and January had an average of 10.2°C, daffodils were in flower on January 12th. Furthermore, Daffodils were in flower in February in one in three years.The correlation suggests that a one degree change in temperature is associated with a six day change in flowering date.

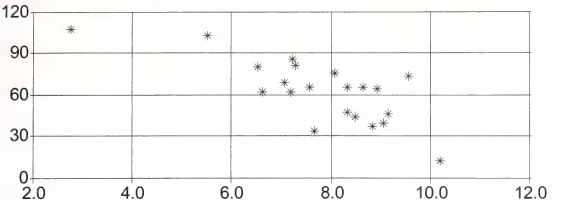

Chart 4 Correlation between Daffodil first dates and whole winter temperature, 1948-1982

Unfortunately few dates were collected during the coldest and warmest winters. Spring species are not often looked for before New Year's Day, but Hazel was recorded twice in December, and it has since become clear that Celandine is also sometimes in flower in late December, but easily missed. There are early garden varieties of Snowdrop and Daffodil, and these have been omitted when it is clear that records refer to them. However the range of dates, which lies between two and three months for each of these four species, is, I suspect, far greater than is normally assumed.

Miss Rogers' results can be compared with my own for Clifton between 1997 and 2010 and those from a twenty year study at Marlborough between 1865 and 1884.

I have done a weekly standard walk through Clifton and across the Downs from 1997-2010, recording every species in flower. This has provided dates that are more precise and consistent than those of Miss Rogers, which may account for the fact that the average for each species is earlier. However the average winter temperature during this period was 0.3ºC warmer at 8.0ºC, and four of the winters had an average of over 9.0ºC and just two below 6.0ºC. The temperature extremes lay between 5.7ºC in 2010 and 9.9ºC in 1999, a range of 4.2ºC. The average range of the first flowering dates of the four species was 54 days, suggesting an average change of thirteen days for each degree change of temperature.

Bland	Earliest date	Latest date	Average date	Range	Difference from Miss Rogers
Snowdrop	3	39	18	36	-3
Hazel	-2	39	18	41	-6
Celandine	-5	77	36	82	-15
Daffodil	22	79	46	57	-18
Avg			30	54	-10

Table 2 Summary of First flowering dates for four species, Clifton, 1997-2010

Chart 2 shows the correlation between the winter temperatures and the first flowering dates, and suggest that one degree change in temperature is associated with a ten day change in date.

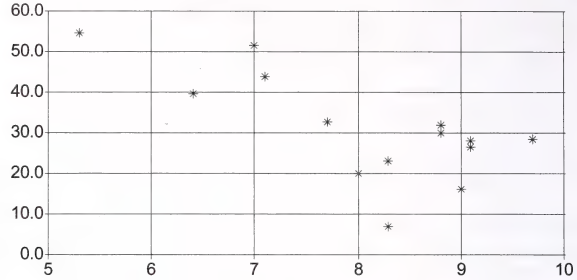

Chart 5 Correlation between the winter temperature and the average first flowering date of four species, in Clifton 1997-2010

A member of staff at Marlborough College organized the collection of phenological data for all taxa in the region between 1865 and 1884, probably as a specific attempt to compare data with that obtained by Gilbert White, further south in Hampshire, over 25 years between 1768 and 1793. This was combined with very detailed weather measurements. The twenty year winter average was 6.7ºC, a full degree colder than during Miss Rogers' time. There was just one winter above 9.0ºC and ten were below 7.0ºC, the coldest, 1879, being one of just four winters since 1853 to have an average below 4.0ºC. The total range was 5.2ºC, and the average range of plant dates 48 days suggesting a change of nine days for each degree change in temperature.

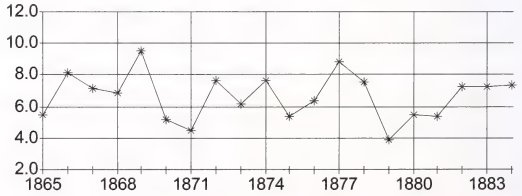

Chart 6 Winter Temperatures at Marlborough 1865-1884.

Table 3 shows the difference between the Marlborough dates and those of Miss Rogers.

As average winter temperature at Marlborough was a degree colder, it would be anticipated that average dates would be around seven days later, as is true for Snowdrop and Hazel. The implication for Celandine is that Miss Rogers' observations were seriously late, and probably reflected the peak of Celandine flowering, which can come well after first flowering. There is almost no difference between the Marlborough average for Celandine and my recent Clifton average, despite a 1.3ºC difference in temperature, which is probably a consequence of the fact that Celandine flowering dates are often affected more by December and early January temperatures rather than by whole winter averages. Half the Marlborough Daffodil dates were before March 1st, which again implies that Miss Rogers sometimes missed the real first date.

Marlborough	Earliest date	Latest date	Average date	Range days	Difference from Miss Rogers
Snowdrop	11	47	28	36	7
Hazel	15	57	31	42	7
Celandine	3	65	38	62	-13
Daffodil	43	94	61	51	-3
Avg			40	48	0

Table 3 Summary of first flowering dates of four species at Marlborough, 1865-84

The results from the average of all four species each year for Marlborough are shown in Chart 7, and imply a change of eight days in date for each degree change in temperature

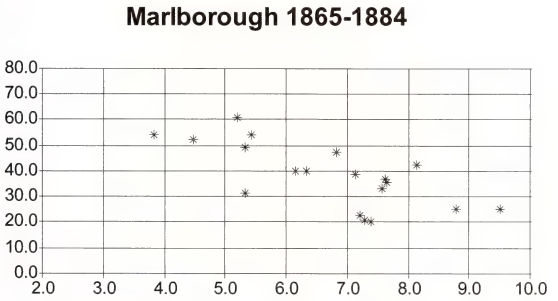

Chart 7 Correlation between four spring species first flowering dates and winter temperature at Marlborough, 1865-1884

Chart 8 shows forty years of data from Marlborough and Clifton for the average first flowering date of the three species, Snowdrop, Hazel and Celandine over the 145 years between 1865 and 2010 showing the relationship between date and temperature. It suggests a ten day change in date for each degree change in temperature.

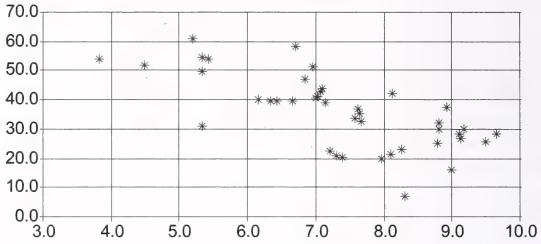

Chart 8 Correlation between three spring species and temperature, 1865-2010

Gilbert White's dates between 1768 and 1793 are show an average range of 44 days for all four species, though he only provided an earliest and a latest first date, and the mean is assumed to be the date half-way between. His Celandine dates are sharply later, but the Snowdrop and Hazel dates were very close to Miss Rogers'. His friend William Markwick, at Battle in Sussex, has distinctly later dates, except for Celandine, implying rather colder springs. Of course late dates could also be caused by inaccurate recording. The figures imply that winter temperatures in the last half of the 18th century averaged around 6.5°C, very similar to those at Marlborough 1865-84.

White	Earliest date	Latest date	Mean date	Range	Difference from Miss Rogers
Snowdrop	10	36	23	24	3
Hazel	3	32	31	56	7
Celandine	52	103	77	51	26
Daffodil	55	97	77	44	13
Avg			52	44	

Markwick					
Snowdrop	18	60	40	42	19
Hazel	21	71	45	50	21
Celandine	25	85	55	60	4
Daffodil	57	108	82	51	18
Avg			56	51	

Conclusion

The recorded winter temperatures in Bristol since 1853 have varied by just over seven degrees, and the earliest spring plants react to that change with approximately a ten day change in date per degree of temperature change. However average winter temperatures since 1950 have been about a degree warmer than those in the latter half of the 19c, and White's evidence suggests that his temperatures were similar to those in the 19th century. There has however been no significant trend since 1950. Should the climate change further in future the average dates of plants flowering would also change. However the hours of daylight are also a key factor for plant activity, and they are fixed by our latitude, and may limit the degree of change that is possible.

Notes on the wildlife of Crow Lane Open Space, Henbury, Bristol, 2007-2009

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In 2009 Bristol City Council invited local residents in the Henbury district to complete a questionnaire concerning its proposed improvements to the Crow Lane Open Space (O.S.map ref.: ST566790). As well as completing and returning the questionnaire to the Council's Community Engagement Team at the end of May that year, I appended a summary of the flora and fauna I had recorded there up to that date. As this Bristol Open Space contains much of wildlife interest I have considered it worth publishing the following preliminary account in this journal. Moreover, I consider that it should have been designated as a site of conservation interest in the Greater Bristol Nature Conservation Strategy (English Nature 1991).

Prior to the 1950s, the Henbury district largely consisted of agricultural land, farmed by the adjacent Elms Dairy, Norton and Westmoreland Farms, surrounding the ancient village of Henbury. The Crow Lane Open Space lying between the Norton and Westmoreland Farms is practically all that survives of the pre-1950 countryside that existed immediately to the north of the village.

Today, the Open Space, managed by the City of Bristol's Parks Department, consists largely of a mosaic of managed grassland (regularly mown), areas of lank vegetation and narrow belts of woodland and scrub. One of its most attractive feature is the Hazel Brook, a narrow stream that winds its way between steep banks from north to south to combine with the River Trym and then eventually to flow into the River Avon at Sea Mills. Its course through the Open Space is lined with such trees as Crack Willow *Salix fragilis* and its banks are covered with a luxuriant growth of Dewberry *Rubus caesius,* Common Comfrey *Symphytum officinale,* Common Nettle *Urtica dioica,* Hogweed *Heracleum sphondylium*, Hemlock Water Dropwort *Oenanthe crocata* and other species.

Dragonflies (Odonata) apparently breeding in the Hazel Brook include the Beautiful Demoiselle Damselfly *Calopteryx virgo*, the Large Red Damselfly *Pyrrhosoma nymphula*, the Azure Damselfly *Coenagrion puella* and the Hairy Dragonfly *Brachytron pratense.* Sadly, the brook is used by some local residents as a depository for such rubbish as supermarket trolleys and I have not so far seen any fish in it, although I understand that they used to occur. Fortunately, there are plans afoot to clean it up, so we can but hope.

A meadow-like area north-west of the Hazel Brook, which was apparently the former Exhibition or Show Field, is now covered with a luxuriant growth of tall grasses, such as False Oat-grass *Arrhenatherum elatius* and Cock's-foot *Dactylis glomerata,* intermixed with Dewberry, Common Comfrey, Hogweed, Cow Parsley *Anthriscus sylvestris*, Meadow Buttercup *Ranunculus acris,* Common Ragwort *Senecio jacobaea and* Crow Garlic *Allium vineale.* Here butterflies, such as Meadow Brown *Maniola jurtina*, Ringlet *Aphantopus hyperantus,* Small Tortoisehell *Aglais urticae* and Peacock *Inachis io* fly in some plenty. On 24 June 2009 I saw at least eight *urticae* imagines in this spot, an extraordinary number in view of the scarcity of this species in recent years. In addition, I found on the nettles a brood of young *urticae* larvae and two large broods of Peacock larvae, one almost full grown and the other still very small, adjacent to their larval web. I also located the larval shelters of the Mother-of-Pearl Moth *Pleuroptya ruralis* in rolled-up leaves of the nettles.

Strips of land bordering the Hazel Brook elsewhere are similarly vegetated with a thick growth of these plants, interspersed with Crack Willows, Elders *Sambucus nigra,* White Poplars *Populus alba* Hazels *Corylus avellana* and other trees. Farther to the north-west there are strips of woodland along the paths where Speckled Wood Butterflies *Pararge aegeria* fly in considerable numbers as they do elsewhere in suitable habitat in the Open Space. Other butterflies I have so far seen in the Open Space are Brimstone *Gonepteryx rhamni,* Large White *Pieris brassicae,* Small White *P. rapae,* Green-veined White *P. napi,* Orange Tip *Anthocharis cardamines,* Painted Lady *Vanessa cardui* and Small Heath *Coenonympha pamphilus.* I have also come across such moths as the Cinnabar *Tyria jacobaeae* and the Yellow Shell *Camptogramma bilineata.* There is obvious scope for recording many more, especially by the use of a mercury vapour moth trap.

The bird-life of the area is varied; so far I have seen Mallard (in Hazel Brook), Woodpigeons, Blackbirds, Song Thrushes, Robins, Blackcaps, Chiffchaffs, Dunnocks, Wrens, Blue, Great and Long-tailed Tits, Treecreepers, Carrion Crows, Jackdaws, Magpies and Greenfinches. Black-headed, Herring and Lesser Black-backed Gulls are almost always to be seen patrolling overhead.
Regular observations throughout the year would almost certainly add 10 or more additional species.

The 119 species of wild plants that I have recorded so far in the Open Space are as follows:-

Austrian/Corsican Pine *Pinus nigra* J.F. Arnold: one mature tree.
Yew *Taxus baccata* L.: several trees.
Lenten-rose *Helleborus orientalis* Lam: Not seen by me, but a 'fine specimen' was found by I.P. Green on the west bank of the Hazel Brook (Green *et al.*, 2000)
Meadow Buttercup *Ranuncukus acris* L.: abundant.
Creeping Buttercup *R. repens* L.: abundant.
Bulbous Buttercup *R. bulbosus* L.: common.
Lesser Celandine *R. ficaria* L.: common.
Greater Celandine *Chelidonium majus* L.: frequent.
Common Stinging Nettle *Urtica dioica* L.: abundant.
Turkey Oak *Quercus cerris* L.: one tree.
Common/Pedunculate Oak *Q. robur* L.: several trees at least.
Silver Birch *Betula pendula* Roth: one large tree noted.
Hazel *Corylus avellana* L.: frequent.
Common Chickweed *Stellaria media* (L.): common.
Common Mouse-ear *Cerastium fontanum* Baumg.: common.
White Campion *Silene latifolia* Poir.: common.
Red Campion *S. dioica* (L.): frequent.
Knotgrass *Polygonum aviculare* L.: common.
Common Sorrel *Rumex acetosa* L.: frequent.
Broad-leaved Dock *R. obtusifolius* L.: frequent.
Perforate St. John's-wort *Hypericum perforatum* L.: frequent.
Large-leaved Lime *Tilia platyphyllos* Scop.: one large tree.
Common Lime *T. x europaea* L.: frequent.
Common Mallow *Malva sylvestris* L.: common.
White Bryony *Bryonia dioica* L.: frequent in the hedgerows.
White Poplar *Populus alba* L.: several trees noted.
Crack Willow *Salix fragilis* L.: frequent along the Hazel Brook.
Goat Willow (Sallow) *S. 'caprea'* L.: Occasional.
Hedge Mustard *Sisymbrium officinale* (L.): frequent.
Garlic Mustard *Alliaria petiolata* Cavara & Grande.: common.
Winter-cress *Barbarea vulgaris* W.T. Aiton: frequent.
Water-cress *Rorippa nasturtium-aquaticum*: (L.): plentiful in a small, stagnant, duckweed-covered pool.
Hairy Bitter-cress *Arabis hirsuta* L.: frequent.
Shepherd's-purse *Capsella bursa-pastoris* (L.): common.
Hoary Cress (Pepperwort) *Lepidium d. draba* L.: frequent in suitable habitat, such as around the Crow Lane entrance.
Perennial Wall-rocket *Diplotaxis tenuifolia* (L.): as the previous species.
Charlock *Sinapis arvensis* L.: frequent.

Bramble (Blackberry) *Rubus fruticosus* agg.: abundant.
Dewberry *Rubus caesius* L.: frequent, especially by Hazel Brook.
Silverweed *Potentilla anserina* L.: common.
Creeping Cinquefoil *P. reptans* L.: frequent.
Wood Avens *Geum urbanum* L.: common.
Dog-rose *Rosa canina* L. common in the hedgerows.
(Sweet-briar *R. rubiginosa* L. wild roses, which I considered to be this species, were frequent in a hedgerow. Identification requires checking).
Blackthorn *Prunus spinosa* L.: frequent.
Bullace *P. domestica* L. ssp. *insititia* (L.): occasional.
Wild (Gean) Cherry *Prunus avium* L.: several.
Hawthorn *Crataegus monogyna* Jacq.: common.
Common Bird's-foot Trefoil *Lotus corniculatus* L.: occasional in open grassland.
Tufted Vetch *Vicia cracca* L.: frequent.
Bush Vetch *V. sepium* L.: frequent.
Common Vetch *V. sativa* L.: frequent.
Meadow Vetchling *Lathyrus pratensis* L.: frequent.
Black Medick *Medicago lupulina* L.: frequent.
White Clover *Trifolium repens* L.: common
Hop Trefoil *T. campestre* Schreb.: frequent.
Red Clover *T. pratense* L.: especially abundant.
Great Willowherb *Epilobium hirsutum* L.: frequent.
Broad-leaved Willowherb *E. montanum* L.: frequent.
Mistletoe *Viscum album* L.: noticed on some trees, such as lime.
Sycamore *Acer pseudoplatanus* L.: several trees.
Cut-leaved Crane's-bill *Geranium dissectum* L.: frequent.
Hedgerow Crane's-bill *G. pyrenaicum* Burm.: frequent (Plate 6).
Dove's-foot Crane's-bill *G. molle* L.: common.
Herb-Robert *G. robertianum* L.: common.
Ivy *Hedera helix* L.: very common.
Cow Parsley *Anthriscus sylvestris* (L.): especially abundant.
Hemlock Water-dropwort *Oenanthe crocata* L.: frequent along the Hazel Brook.
Hogweed *Heracleum sphondylium* L.: common.
Upright Hedge-parsley *Torilis japonica* (Houtt.): frequent.
Bittersweet (Woody Nightshade) *Solanum dulcamara* L.: frequent.
Field Bindweed *Convolvulus arvensis* L.: frequent.
Hedge Bindweed *Calystegia sepium* (L.): frequent.
Large Bindweed *C. silvatica* Griesb.: frequent.
Common Comfrey *Symphytum officinale* L.: very common (Plate 7).
Rough Comfrey *S. asperum* Lepech.: not seen by me, but a 'fairly large patch' of this very rare alien was found by R. Milne on 'open grassy ground' at Henbury in 1990 (Willis, 1990, Green *et al.* 2000).
Green Alkanet *Pentaglottis sempervirens* (L.): frequent.

Hedge Woundwort *Stachys sylvatica* L.: frequent.
White Dead-nettle *Lamium album* L.: common.
Red Dead-nettle *L. purpureum* L.: common.
Ground-ivy *Glechoma hederacea* L.: common.
Greater Plantain *Plantago major* L.: common.
Ribwort Plantain *P. lanceolata* L.: common.
Butterfly-bush *Buddleja davidii* Franch.: occasional
Ash F*raxinus excelsior* L.: occasional.
Ivy-leaved Toadflax *Cymbalaria muralis* (P. Gaertn.): frequent on old walls.
Purple Toadflax *Linaria pupurea* (L.): occasional on rough ground, etc.
Heath Speedwell *Veronica officinalis* L. at least one large patch.
Common Field-speedwell *V. persica* L.: occasional.
Slender Speedwell *V. filiformis* Sm.: frequent.
Ivy Broomrape *Orobanche hederae* Duby: occasional on ivy.
Hedge Bedstraw *Galium mollugo* L.: frequent.
Cleavers *G. aparine* L.: common.
Elder *Sambucus nigra* L.: frequent.
Red Valerian *Centranthus ruber* (L.): common
Lesser Burdock *Arctium minus* (Hill): occasional.
Spear Thistle *Cirsium vulgare* (Savi): frequent.
Creeping Thistle *C. arvense* (L.): common.
Chicory *Cichorium intybus* L.: noted by R.L Bland growing in a hedge at Henbury in 2002 (Willis 2003).
Nipplewort *Lapsana communis* L.: frequent.
Goat's-beard *Tragopogon pratensis* L.: occasional.
Smooth Sow-thistle *Sonchus oleraceus* L.: frequent.
Prickly Sow-thistle *S. asper* (L.): frequent.
Prickly Lettuce *Latuca serriola* L.: frequent.
Wall Lettuce *Mycelis muralis* (L.): occasional.
Daisy *Bellis perennis* L.: common.
Mugwort *Artemisia vulgaris* L.: occasional.
Yarrow *Achillea millefolium* L.: common,
Oxeye Daisy *Leucanthemum vulgare* Lam.: common.
Common Ragwort *Senecio jacobaea* L.: frequent.
Groundsel *S. vulgaris* L.: frequent.
Wild Arum (Lords-and-Ladies) *Arum maculatum* L.: frequent.
Duckweed *Lemna* sp. Very plentiful on a small, stagnant pool in a hollow.
Cock's-foot Grass *Dactylis glomerata* L.: common.
False Oat-grass *Arrhenatherum elatius* (L.): abundant.
Yorkshire-fog Grass *Holcus lanatus* L.: common.
Wall Barley *Hordeum murinum* L.: frequent.
Crow Garlic *Allium vineale* L.: frequent.

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Notes on the Flora and Fauna of Badock's Wood, Southmead, Bristol, 1977-1984.

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Abstract
An account is given of species of Flora and Fauna seen in Badock's Wood, Southmead, north-west Bristol, during the eight years from 1977-1984 inclusive. Among those recorded were 80 species of plants, 41 species of birds, of which 24 were known or thought to have bred at least once, and 14 species of butterflies.

Introduction
During the eight years from 1977 to 1984 inclusive, when I resided in Henleaze, Bristol, I frequently visited nearby Badock's Wood (O.S. map ref.: ST580777) in the Southmead ward of Bristol. This is included in the Nature Conservancy Council's (now English Nature) Inventory of Ancient Woodland as an area of semi-natural broad-leaved woodland. It was thus included as such in the Greater Bristol Nature Conservation Strategy (English Nature 1991) and classed there as a C4 site. Recently I found time to extract from my natural history journal my observations on the wildlife I found there and in the immediately adjacent surroundings during those years and present them in this paper. They were not evenly spaced over each calendar year as my visits did not follow any set pattern, but, taken overall for the whole period, I believe they do provide a good coverage of the seasons. They also reflect my particular interests: thus while the coverage of flowering plants, mammals, birds, Orthoptera and diurnal Lepidoptera is reasonably good, the records of other insect orders are fragmentary, while those of other plant and animal groups are virtually non-existent. Nevertheless, I feel that the records presented in this paper will be of some use in substantiating the value of Badock's Wood to the wildlife and the human community, which I understand is protected under policy C4 of the Avon County Structure Plan (2nd Alteration) and also, since January 2008, as an officially designated Local Nature Reserve.

On 26 July 1978 I wrote in my private journal that ' This little wood which clothes the steep, rocky limestone sides of the River Trym valley is quite attractive, and would be even more attractive if it were not for the heavy human pressure it receives from the surrounding residential areas. Here children play in robust fashion, people exercise their dogs, and others dump their refuse, including old cars, usually in the River Trym. This otherwise pretty little river, with its little waterfalls, seems to be heavily polluted. On 8 June 1978, for instance, I noted two cars and a variety of other rubbish that had been dumped in the river. In my journal entry of 24 September 1984 I noted that I had seen no sign of a then proposed clean-up and that, with the water level low due to a recent drought, the polluted water stank.

However, I was delighted to learn from my friend, David J. Tombs, who visited the wood on 13 August 2009 at my request, that he found the condition of the river was now 'generally very good': he found only one car tyre there and very little else. The great improvement of the reserve and its river is due to the admirable activities since 1998 of the Friends of Badock's Wood (www.fobw.co.uk) supported by the British Trust for Conservation Volunteers (BTCV) and Bristol City Council. These have not only included the clearance of rubbish from the woods and river, but also wild flower, hedge and thicket planting, the sowing of two adjacent wildflower meadows, and the installation of bat, owl and other types of bird nestboxes.

In the period under review I further recorded in my journal that 'Ash is the dominant tree in the wood, but there are some fine mature oaks, Beeches, Sycamores and Horse Chestnuts. The understorey consists largely of Hazel, Hawthorn and some Box, with a good deal of Bramble, Hop, Ivy, Wild Clematis and Common Nettle.' At that time the western part of the wooded valley descended through what was then a small, enclosed wildlife park that extended to the edge of Westbury-on-Trym village. During 1978 a new housing development began on the adjacent former Queen Elizabeth Hospital sports ground and the Clifton Rugby Football Club's former ground between Badock's Wood and Eastfield Road, which inevitably had a detrimental effect on the wildlife interest of the southern fringes of the wood.

Flora

I am not primarily a botanist, but in the course of my visits I noted the following 80 species:-

Hart's-tongue Fern *Phyllitis scolopendrium* (L.) Newman: plentiful, 6 June 1978.
Wood Anemone *Anemone nemerosa* L.: flowering in profusion here and there in the wood, April 1977.
Traveller's-joy *Clematis vitalba* L.: noted as plentiful on 21 August 1997 and 26 July 1978.
Meadow Buttercup *Ranunculus acris* L.: plentiful.
Creeping Buttercup *R. repens* L.: common along path verges.
Bulbous Buttercup *R. bulbosus* L.: common in suitable habitat around the wood.
Lesser Celandine *R. ficaria* L.: abundant
Hop *Humulus lupulus* .L.: frequent, 26 July 1978.
Common Nettle *Urtica dioica* L.: abundant.
Beech *Fagus sylvatica* L.: several trees; some of them fine mature ones.
Pedunculate Oak *Quercus robur* L.: one of the dominant trees of the wood; some of them fine, mature examples.
Hazel *Corylus avellana* L.: co-dominant with Hawthorn *Crataegus monogyna* Jacq., in the wood's understorey.
Common Chickweed *Stellaria media* (L.): common.
White Campion *Silene latifolia* Poir.: frequent.

Red Campion *S. dioica* (L.) : flowering in profusion along path verges.
Wood Dock *Rumex sanguineus* L.: frequent.
Broad-leaved Dock *R. obstusifolius* L.: common.
Common Mallow *Malva sylvestris* L. : frequent.
Common Dog-violet *Viola riviniana* Rchb.
White Bryony *Bryonia dioica* Jacq.: occasional.
Garlic Mustard *Alliaria petiolata* Cavara & Grande: common.
Shepherd's-purse *Capsella bursa-pastoris* (L.): frequent around the wood.
Meadowsweet *Filipendula ulmaria* (L.): a flourishing patch noted flowering beside the River Trym in July 1978.
Bramble (Blackberry) *Rubus fruticosus* agg.: common.
Wood Avens *Geum urbanum* L.: frequent along path verges.
Field-rose *Rosa arvensis* Huds.: frequent.
Short-styled Field-rose *R. stylosa* Desv.: frequent.
Dog-rose *R. canina* L.: frequent.
Blackthorn *Prunus spinosa* L.: frequent.
Hawthorn *Crataegus monogyna* Jacq.: common and co-dominant with Hazel in the wood's understorey.
Common Bird's-foot Trefoil *Lotus corniculatus* L.: frequent in grassy areas around the wood before housing development and subsequently surviving on grassy verges along the estate roads..
Bush Vetch *Vicia sepium* L.: frequent.
Common Vetch *V. sativa* L.: frequent.
White Clover *Trifolium repens* L.: frequent.
Hoary Willowherb *Epilobium parviflorum* Schreb.: frequent.
Rosebay Willowherb *Chamerion angustifolium* (L.): in profusion on the steep slopes.
Holly *Ilex aquifolium* L.: frequent.
Box *Buxus sempervirens* L.: occasional in the understorey.
Dog's Mercury *Mercurialis perennis* L.: abundant.
Annual Mercury *M. annua* L.: frequent.
Horse-chestnut *Aesculus hippocastanum* L.: some fine mature trees.
Sycamore *Acer pseudoplatanus* L.: several mature trees.
Herb-Robert *Geranium robertianum* L.: very common along path verges.
Ivy *Hedera helix* L.: abundant.
Cow Parsley *Anthriscus sylvestris* (L.): abundant along path verges.
Hemlock Water-dropwort *Oenanthe crocata* L.: frequent along a tributary of the River Trym within the boundary fence of the nearby Henleaze Swimming Pool.
Hogweed *Heracleum sphondylium* L.: frequent.
Upright Hedge-parsley *Torilis japonica* (Houtt.): frequent.
Wild Carrot *Daucus carota* L.: a single plant in the verge of a hedgerow, August 1977.
Field Bindweed *Convolvulus arvensis* L.: common.

Hedge Bindweed *Calystegia sepium* (L.): frequent.
Hedge Woundwort *Stachys sylvatica* L.: abundant.
Black Horehound *Ballota nigra* L.: common.
White Dead-nettle *Lamium album* L.: abundant, especially along path verges.
Red Dead-nettle *L. purpureum* L.: frequent.
Ground-ivy *Glechoma hederacea* L.: common.
Greater Plantain *Plantago major* L.: common.
Hoary Plantain *P. media* L.: frequent in the adjacent grassland.
Ribwort Plantain *P. lanceolata* L.: common.
Butterfly-bush *Buddleja davidii* Franch.: several bushes established close to the wood.
Ash *Fraxinus excelsior* L.: the dominant tree in the wood.
Great Mullein *Verbascum thapsus* L.: a few plants at the wood edge.
Purple Toadflax *Linaria purpurea* (L.): a particularly fine group of plants flowering beside the River Trym in July 1978.
Germander Speedwell *Veronica chamaedrys* L.: several large flowering patches.
Nettle-leaved Bellflower *Campanula trachelium* L.: a single plant in full bloom beside the River Trym.
Cleavers *Galium aparine* L.: common.
Elder *Sambucus nigra* L.: frequent.
Wild Teasel *Dipsacus fullonum* L.: several plants growing on a steep slope in June 1978.
Nipplewort *Lapsana communis* L.: frequent.
Wall Lettuce *Mycelis muralis* (L.): frequent.
Dandelion *Taraxacum officinale* agg.: common.
Rough Hawk's-beard *Crepis biennis* L.: one plant in flower, 11 July 1978.
Daisy *Bellis perennis* L.: common in grassy areas.
Yarrow *Achillea millefolium* L.: common.
Oxeye Daisy *Leucanthemum vulgare* Lam.: plentiful in the adjacent grassland.
Common Ragwort *Senecio jacobaea* L.: present in small quantity.
Wild Arum (Lords & Ladies) *Arum maculatum* L.: common.
Wood Millet *Milium effusum* L.: common, especially along the paths.
Bluebell *Hyacinthoides non-scripta* (L.) : abundant here and there in the wood.
Ramsons *Allium ursinum* L.: common.

Mammals

Brown Rat *Rattus norvegicus* (Berkenhout): seen in the former wildlife park area and presumably occurred throughout Badock's Wood.
Grey Squirrel *Sciurus carolinensis* Gmelin: a few breeding pairs. On 9 July 1977 I found a noisy litter in an ivy-covered oak near the top of a wooded slope.
Fox *Vulpes vulpes* (L.) occasionally seen and heard.

Birds

Altogether I recorded 41 species, of which 24 bred or were believed to have done so at least once.

Mallard *Anas platyrhynchos* L.: pairs occasionally seen on the River Trym within the wood.

Grey Heron *Ardea cinerea* L.: one or two at a time occasionally seen circling over the wood and the adjacent former wildlife park.

Eurasian Sparrowhawk *Accipiter nisus* (L.): occasionally seen, but not known to breed.

Black-headed Gull *Larus ridibundus* L: frequently seen flying over, especially in the colder months.

Lesser Black-backed Gull *L. fuscus* L.: frequently seen flying over.

Herring Gull *L. argentatus* Pontoppidan: frequently seen flying over.

Stock Pigeon (Dove) *Columba oenas* L.: one heard advertisement singing on 24 July 1984.

Common Wood Pigeon *C. palumbus* L.: several pairs bred annually.

Eurasian Collared Dove *Streptopelia decaocto* (Frivaldsky): frequently seen around the wood and feeding at the former wildlife park animal food containers.

Common Swift *Apus apus* (L.):frequently seen flying over.

Great Spotted Woodpecker *Dendrocopos major* (L.): a pair bred in most years. In July 1977 I heard nestlings calling from a hole in an Ash tree and on 11 July 1978 I watched an adult being pursued by a food-begging juvenile.

Lesser Spotted Woodpecker *D. minor* (L.): on 24 July 1984 I watched one hammering at the top of a tall, mature oak and knocking pieces of decayed wood up to 10cm (4 inches) in length to the ground.

House Martin *Delichon urbicum* (L.): occasionally seen flying over.

Grey Wagtail *Motacilla cinerea* Tunstall: birds seen throughout the year on the River Trym and bred or probably bred in most years. On 9 June 1984, for example, I saw a pair with at least one fledgling which I estimated had left the nest about a week before. On 11 December 1977 three birds were present, two of which were males that displayed to each other, uttering snatches of song.

Winter Wren *Troglodytes troglodytes* (L.): at least one pair bred annually.

Hedge Accentor (Dunnock) *Prunella modularis* (L.): at least two pairs bred annually.

Robin *Erithacus rubecula* (L.): at least two pairs bred annually.

Common Blackbird *Turdus merula* L.: at least three pairs bred annually.

Song Thrush *T. philomelos* Brehm: at least two pairs bred annually.

Redwing *T. iliacus* L.: small numbers seen in most winters.

Mistle Thrush *T. viscivorus* L.: a pair bred in most years.

Blackcap *Sylvia atricapilla* (L.): up to three males singing in most springs; at least one pair bred or probably did so annually.

Common Chiffchaff *Phylloscopus collybita* (Vieillot): up to two males singing in most springs and a pair probably bred in most years.
Willow Warbler *P. trochilus* (L.): singing males passed through on passage in most years.
Goldcrest *Regulus regulus* (L.): in 1977 a pair bred successfully about three metres up in ivy growing on a young Ash tree. Breeding probably occurred in some other years, such as 1984. Very small numbers were sometimes seen in winter
Spotted Flycatcher *Muscicapa striata* (Pallas): on 15 July 1977 I watched a pair feeding fledglings and also encountered a family party in the wood on 7 July 1978 and again on 24 July 1984.
Long-tailed Tit *Aegithalos caudatus* (L.): a pair probably bred in most years.
Coal Tit *Periparus ater* (L.): a male singing in the wood on 12 March 1978.
Blue Tit *Cyanistes caeruleus* (L.): at least two pairs bred annually.
Great Tit *Parus major* L.: at least three pairs bred annually.
Eurasian Treecreeper *Certhia familiaris* L.: a pair bred successfully in an oak in 1984 and probably did so in previous years.
Eurasian Jay *Garrulus glandarius* (L.): single birds frequently present in the winter months. I have no evidence of breeding in these years.
Black-billed Magpie *Pica pica* (L.): a pair bred annually.
Jackdaw *Corvus monedula* L.: birds frequently flew over the wood and fed on the adjacent grass areas.
Carrion Crow *C. corone* L.: a pair bred annually: nest sites included the top of a Beech tree. On 22 January 1978 I watched a highly vocal and excited gathering of 15 in aqdjacent oak trees behaving rather aggressively to each other.
Common Starling *Sturnus vulgaris* L.: a few pairs nested annually in tree holes in the wood. Flocks of adults and juveniles were often to be seen feeding on adjacent grassland.
House Sparrow *Passer domesticus* (L.): birds breeding in nearby housing were often to be seen in the wood throughout the year.
Chaffinch *Fringilla coelebs* L.: two or three pairs at least bred annually.
European Greenfinch *Carduelis chloris* (L.): at least two pairs bred annually.
European Goldfinch *C. carduelis* (L.): a pair probably bred in most years.
Common Bullfinch *Pyrrhula pyrrhula* (L.): a pair bred successfully in 1978 and breeding probably occurred in 1977 and perhaps in other years. Frequently seen in winter.

Insects

I did not attempt a thorough investigation of the insect life of the wood, so the following records are in the nature of casual observations.

Odonata
Southern Hawker Dragonfly *Aeshna cyanea* (Müller): frequently seen patrolling up and down the River Trym.
Brown Hawker Dragonfly *A. grandis* (L.): frequently seen hawking insects along the River Trym and the woodland paths.
Common Darter *Sympetrum striolatum* (Charpentier): frequently seen along the woodland paths and around its borders.

Orthoptera
Dark Bush-cricket *Pholidoptera griseoaptera* (De Geer): small numbers present in nettle-beds around the edges of the wood.
Speckled Bush-cricket *Leptophyes punctatissima* (Bosc.): adult female found on Hawthorn foliage, 11 September 1977.
Field Grasshopper *Chorthippus brunneus* (Thunberg): very numerous in most years in the rough grassy areas bordering the wood and on the former sports fields.

Lepidoptera
Butterflies (14 species)
Small Skipper *Thymelicus sylvestris* (Poda): one, 24 July 1978.
Large Skipper *Ochlodes (venata) faunus* (Turati): present in small numbers. Seen nectaring at Common Ragwort flowers.
Large White *Pieris brassicae* (L.): frequently seen in small numbers most years.
Small White *P. rapae* (L.): numerous most years. Seen nectaring at the flowers of Herb Robert.
Green-veined White *P.napi* (L.). Numerous in most years. Seen nectaring at the flowers of Herb Robert and Red Campion.
Orange-tip *Anthocharis cardamines* (L.): One male seen, 9 June 1984.
Common Blue *Polyommatus icarus* (Rott.): two males seen, 9 June 1984, flying over flourishing Bird's-foot Trefoil growing on the broad grass verges of a road in the adjacent new housing estate built on a former sports field.
Holly Blue *Celasrina argiolus* (L.): both generations frequently seen in good years for this species.
Red Admiral *Vanessa atalanta* (L.): frequent in most years; female seen visiting a potential breeding site in a nettle-bed, 26 July 1978.
Painted Lady *Cynthia cardui* (L.): occasionally seen in good years for this species.
Small Tortoisehell *Aglais urticae* (L.): often seen and sometimes numerous, as in September 1978 when many were seen nectaring at the flowers of Buddleija and Common Ragwort at the edge of the wood. Imagines were also seen nectaring at Red Dead-nettle flowers and broods of larvae were found on Common Nettle in June that year.
Peacock Butterfly *Inachis io* (L.): frequently seen.
Comma Butterfly *Polygonia c-album* (L.): occasionally seen. On 26 July 1978 three were seen flying around a tangled mass of Bramble, Hop and Common Nettle

growing beside the small tributary which joins the River Trym on the south side of the wood.
Speckled Wood *Pararge aegeria* (L.): plentiful in most years.

Moths

Nematopogon schwarziellus Zeller: one at an edge of the wood, 22 May 1977.
Green Longhorn *Adela reaumurella* (L.): many noted along the southern edge of the wood, 22 May 1977.
Silver Y *Autographa gamma* (L.). Occasionally seen in most years.

Diptera

Hoverflies (Syrphidae)
Episyrphus balteatus (Degeer): usually numerous. Very abundant at Traveller's-joy blossoms on the southern edge of the wood, 21 August 1977.
Syrphus ribesii (L.): usually numerous, such as on 21 August 1977 at Traveller's-joy blossoms on the southern edge of the wood.
Rhingia campestris Meigen: abundant at Field Bindweed and Yarrow flowers, 21 August 1977.
Helophilus pendulus (L.): as *S. ribesii.*
Volucella zonaria (Poda): one seen nectaring at Hogweed flowers, 24 July 1978.

Hymenoptera

Chalcid wasp *Pteromalus* sp.: on 21 August 1977 I saw a green species of this genus, possibly *puparum* (L.), swarming at the flowers and foliage of Traveller's-joy.
Honey Bee *Apis* mellifera L.: usually very numerous at Bramble flowers, etc.
Garden Bumble Bee *Bombus* hortorum (L.): numerous.
Common White-tailed Bumble Bee *B.* lucorum (L.): numerous.
Buff-tailed Bumble Bee *B. terrestris* (L.): numerous.
Meadow Bumble Bee *B. pratorum* (L.): numerous; seen visiting Dandelion and Red Dead-nettle flowers.
Common Carder Bee *B. pascuorum* (Scopoli): numerous: seen visiting Red Dead-nettle flowers.
Large Red-tailed Bumble Bee *B. lapidarius* (L.): numerous.

Coleoptera

Soldier Beetle *Cantharis decipiens* Baudi: two seen on 22 May 1977.

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Reference

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Initial observations from monitoring the Leigh Woods Hazel Dormouse Population: 2007 – present.

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Introduction

The national and international decline in the population of the Hazel Dormouse (*Muscardinus avellanarius*), particularly in the northern parts of its range, has afforded the species international protection under the Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora), transposed into national legislation by the Conservation of Habitats and Species Regulations 2010. The species is also a UK Biodiversity Action Plan priority species.

The southwest of England does however appear to be a UK stronghold for the Hazel Dormouse, and the population is monitored at many sites for the National Dormouse Monitoring Programme. Little was known about the present status of dormice in Leigh Woods (North Somerset) until a survey and monitoring programme was initiated in 2007. Prior to this Bristol Regional Environmental Records Centre hold a single record from 1994, and incidental observations were communicated to the author by the National Trust.

2007 and 2008 survey

Although absent of strong connectivity to the wider landscape, the habitat provided by Leigh Woods is in many places optimal for the Hazel Dormouse, consisting of ancient semi-natural woodland with a dense Hazel (*Corylus avellana*) understorey.

Several areas of the National Trust owned woodland were surveyed for dormouse presence/absence in 2007 and 2008. Survey tubes were placed in areas of optimal habitat (in Leigh Woods this consists of dense ancient woodland coppice) in a rough grid pattern with tubes spaced approximately 20m apart (Area 1). Twenty tubes were erected in June 2007 and dormouse presence was found during the first survey visit one month later. By October 2007 five of the tubes had contained evidence of dormouse use (individuals and/or their nests).

A further 25 tubes were erected at the beginning of September 2007 in a different area of coppice, closer to Stokeleigh Camp hill fort and more disturbed (Area 2). A dormouse nest was found in one of these tubes in October 2007. No dormouse evidence was found in this area in 2008. These tubes were not checked in 2009.

In February 2008 the original 20 tubes were relocated to an area of Hazel coppice directly adjacent to Stokeleigh Camp (Area 3). Dormouse presence, in the form of a single nest, was found in this area by the end of the survey season (November 2008). These tubes were not checked in 2009.

Although fewer nests were found in Areas 2 and 3 compared to the first area surveyed (Area 1), no initial inferences can be made in relation to the population densities in the two areas as there are several differing variables and longer term monitoring would be required to make such comparisons.

Monitoring Programme

Leigh Woods became a National Dormouse Monitoring Programme Site in May 2008, when the initial 20 tubes were replaced with 20 permanent wooden nest boxes (Area 1). Two of the boxes were found to contain dormice during the first monitoring visit in June 2008. The first breeding nest containing a litter of dormice was found in August 2008, and a further litter was found in a different box in September 2008. By November 2008 50% of the boxes had been used by dormice.

A further 20 new boxes were erected in March 2009 in an adjacent area of ancient woodland coppice (Area 4) which had not previously been surveyed by the author. These were positioned in two parallel lines with boxes approximately 20m apart. Again, dormouse presence was found during the first monitoring visit in May 2009. In August 2009 three litters were found using the new boxes and in total five litters were found within the 40 boxes.

The greatest number of dormice found during any one monitoring visit to date was in October 2009, with 26 dormice found in total (including adults and juveniles). The heaviest dormouse to date was also found during this visit, weighing 32g. By the end of the 2009 survey season 31 of the 40 boxes (78%) had contained dormice and/or their nests. Of the nine boxes not containing dormouse evidence, six were of the original 20 boxes (Area 1) and three were new boxes (Area 4).

In terms of the occupancy of boxes (70% of the original 20 boxes in Area 1 were occupied in 2009 compared to 50% in 2008) and the numbers of dormice found it seems that the boxes are directly benefitting the population although it is too soon within the monitoring programme to draw any conclusions.

In May 2010 a further 30 boxes were erected. Twenty of these (in two parallel lines of 10 boxes) were erected in an area of 'limited intervention' woodland (Area 5). This area had not been previously surveyed for dormice by the author. Unlike other areas surveyed and monitored, this area showed no signs of previous management by coppice and consisted mainly of mature standard trees with a limited understorey. These boxes connect Areas 4 and 2. No dormouse evidence was found within these boxes during the June 2010 monitoring visit. The remaining 10 boxes were erected in Area 2 on the same trees as 10 of the tubes (which remain in place) and adjacent to the southern end of Area 5.

Future work

It is hypothesised that the habitat within Area 5 is less suitable for dormice and will to some extent pose a barrier to their movement. In order to test this hypothesis it is necessary to monitor boxes both in the shrub layer and the canopy (in this habitat it is the canopy that provides the connectivity between trees). Ten of the 20 boxes within Area 5 are gradually being erected within the canopy, generally on mature oak (*Quercus robur*) trees. Recommendations for the creation of 'dormouse corridors' within the woodland may be possible from this work.

It is hypothesised that the dormouse boxes within Area 2 will be used more readily than the survey tubes.

Any information relating to the presence of dormice in the landscape surrounding Leigh Woods (e.g. Ashton Court and surrounding farmland) would be gratefully received.

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Honorary fish: marine mammals and seabirds as a source of food in Medieval Bristol

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"Whales flesh is the hardest of all other and unusuall to be eaten of our countrymen no not when they are very young and tenderest, yet the livers of whales, sturgeons and dolphins smell like violets, taste most pleasantly being salted and give competent nourishment as Carden writeth".

Extract from *Health's Improvement* by Thomas Muffett
(written 1595, published posthumously 1655).

As unpleasant as this sounds, cetacean and seal meat often appeared on the menus of Medieval and Tudor banquets but declined in popularity in the late sixteenth century (Austin 1888, Drummond & Wilabraham 1939, Furnivall 1868, Simon 1944, Warner 1791). Along with other aquatic mammals and birds, such as Barnacle Geese *Branta bernicula*, Atlantic Puffins *Fratercula artica* and Eurasian Beavers *Castor fiber*, they were regarded as 'honorary fish' and could therefore be eaten throughout Lent, Advent and other meat-free religious days. The same probably applied to the Manx Shearwater *Puffinus puffinus* and Northern Gannet *Morus bassanus* the remains of which have been found at a number of Medieval and Post-Medieval archaeological sites in Britain. Most of these are concentrated in the north of the country but there is an interesting cluster of records from Southwest England, including Bristol Castle. Seabirds, with their oily and fishy flavoured flesh, were very much an acquired taste and would have been eaten by the English aristocracy in the Middle Ages.

Documentary sources from this period show that many species of wild birds, from swans to sparrows were caught, cooked and consumed. Anything, it seems was consideredfair game. The large numbers and variety presented to guests at a banquet would have symbolised the wealth and social status of their host (Albarella & Thomas 2002). Gannet and Manx Shearwater must have been imported into Southwest England from elsewhere in Britain and were therefore expensive to obtain for the dinner table. In the days before the effective refrigeration of food these birds would have been salted down before being transported over long distances. Faunal remains from the Medieval archaeological sites of Exeter, Okehampton Castle and Launceston Castle are compared to those of central Bristol. The apparent trend for the consumption of seabirds and marine mammals in Southwest England is also discussed in this paper.

Common/Grey Seal *Phoca vitulina/Halichoerus grypus*

In 2000, a single seal bone, the ulna from a pup, was excavated from 13-14th century deposits at a high-status archaeological site in Union Street, Bristol. Butchery marks, consistent with dismemberment, were found to be present on the specimen (Higbee 2005a). Assuming that this was Grey Seal, the most common pinniped in British waters, pups are born from September to December. This unfortunate animal was probably taken during the winter and eaten during Advent or preserved for other designated religious 'fysshe days'. The seal has a rather sparse archaeological record in Medieval England but has been found, for example, at the Bedern and Tower Street sites in York (Bond & O'Connor 1999). This suggests that it was less popular as a dish than other marine mammals. Muffett considered seal meat to be only fit for consumption by seamen:

"Seales flesh is counted as hard of digestion, as it is gross of substance, especially being old: wherefore I leave it to mariners and sailors, for whose stomacks itis fittest, and who know the best way to prepare it".

Nevertheless, small quantities of seal meat were imported into Bristol via the City Docks, as shown bt the Exchequer Customs Accounts for 1503-1601 (Flavin & Jones 2009). Animals could also have been obtained locally. Both Common and Grey Seals have been seen, killed or found as tideline corpses in the Severn Estuary (Matthews 1940). The latter occurs more frequently than the former and at least two individuals have ventured up the tidal lower reaches of the River Avon. Single animals are regularly seen along the coast, from Weston-Super-Mare to Northwick Warth, but most records are from Steep Holm Island in the Bristol Channel.

When George Neville, the Chancellor of England, was enthroned as the Archbishop of York in September 1467, twelve porpoises and seals were served up at his inaugural feast (Warner 1791). It is interesting to note that porpoises and seals are lumped in together, implying that the meat of marine mammals was treated as one and the same, perhaps reflecting their status as 'honorary fish'. This could explain why specific recipes for seal meat are strangely absent from many Medieval cookery books (see the species account for the dolphin). The Linnean scientific name *Phocoena* for the Harbour Porpoise is, in fact, derived from the latin *Phoca* for Seal.

Dolphin

Perhaps the most interesting find in recent years has been the toothless lower mandible of an unidentified species of dolphin from late Medieval/early Post-Medieval deposits at St. Thomas Street in Bristol (Higbee 2005b). Dolphins are well represented in the archaeological record and include high-status sites such as Late-Saxon Flixborough, Medieval Castle Rising Castle, late 13/15th century Launceston Castle and 15-16th century Castle Mall (Albarella *et al.* 1997, Albarella & Davis 1996, Dobney *et al.* 2007, Jones *et al.* 1997). Of these, the bones from Launceston in Cornwall have been identified as those of the Common Dolphin *Delphinus delphis.* The 157 specimens (reprasenting a minimum of 58 individuals) from Flixborough in Lincolnshire are mainly from Bottle-nosed Dolphins *Tursiops trunctaus* and formed part of a large assemblage of cetacean bones that also included the Harbour Porpoise *Phocoena phocoena* and Long-finned Pilot Whale *Globicephala melas* (Nichols *et al.* 2007). It is possible that the mandible from St. Thomas Street is all that remains of an animal that was caught in a fishing net or stranded on the coast. Historical occurrences of dolphins along the Avon shores of the Severn Estuary are rare but there are a few records from our area:-

White-beaked Dolphin *Lagenorhynchus albirostris.* One stranded at Portishead on 27 June 1936.

Striped Dolphin *Stenella coeruleoalba.* A female found daed near the Marine Lke at Celevedon on 5 December 1998.

Common Dolphin. One near Shepperdine in April 2003.

Bottle-nosed Dolphin. Single animal at Aust/Northwick Warth on 30 August 1986 and off Sand Point on 3 March 1996.

This apparent scarcity in modern times suggests that dolphin meat was also imported into Bristol during the Middle Ages. The Exchequer Customs Accounts for the Port of Bristol show that porpoise meat was occasionally shipped in from Ireland and Europe in the sixteenth century (Flavin & Jones 2009). It is possible that 'porpoise' was used as a generic term to describe any of the smaller cetaceans found in British waters. Before Linnaeus's *Systema naturae*, with its more scientific nomenclature, was published in 1735 many birds and mammals were known by a bewildering variety of regional old English vernacular names. To confuse matters further, some of these were interchangable between similar yet unrelated species and many different versions appeared in Medieval literature over time. Harbour Porpoises, for example, were referred to by a large number vernacular names including perpes, porpas, porpays, porpeys, purpasse, purpaysse and so on. The dolphin genus *Tursiops* is derived from the latin *Tursio* for porpoise (cf. the 'tursons' mentioned by Muffett below). Medieval cookery books rarely mention recipes for dolphin but there are several for porpoise. The most popular dish in the Middle Ages seems to have been strips of salted porpoise meat in furmenty, a kind of porridge.

Furmenty or frumenty (there are numerous variations in spelling) consisted of unground, hulled wheat boiled in almond milk with saffron and other spices (Hamilton 1993). Venison was usually added but it seems that more exotic meats were used. Muffett was of the opinion that:

"Purpesses, tursons or sea hogs, are of the nature of swine, never good till they be fat...it is an unsavoury meat...yet many ladies and gentlemen love it exceedingly, bak'd like venison".

Many early English recipies clearly demonstrate the culinary skills of Medieval cooks who could enhance or disguise the flavours of bland or strong-tasting meats with a surprising range of expensive spices which they had at their disposal.

Records of Harbour Porpoises, both alive and as tideline corpses, over the last twenty years show that they are fairly frequent visitors to our stretch of the coastline. Most of these sightings are of single animals, mainly in July and August, but occasional pairs do turn up. On a handful of occasions porpoises have also made their way up the tidal River Avon. Seyer (1823) refers to 'a great porpoise fish' caught between Bristol Bridge and the Castle on 16 September 1592 and another between Gibtaylor and Rownham on 21 April 1600 or 1601. James Millerd's 1673 map of *the famous Citty of Bristoll* features stylised depictions of porpoises swimming in what was to become the Floating Harbour, at the locations mentioned by Seyer. Clearly, the folk memories of these sixteenth century visitations are preserved in Millerd's map. One captured in the Horseshoe Bend of the River Avon on 22 September 1910, was once in the biological collections of Bristol City Museum. Like many other valuable specimens, it was destroyed during the Bristol Blitz. The most recent record is of two animals that were seen in the New Cut between Vauxhall and Gaol Ferry Bridges on 13 April 2003.

Northern Gannet *Morus bassanus*

The gannet has been found at over fifty archaeological sites in Britain, Mainly around the Scottish coast and its offshore island archipelagos of Orkney, Shetland and the Inner/Outer Hebrides (Yalden & Albarella 2009, D.Yalden *pers.comm.*). There are a few records from the southern half of the country, with a distinct cluster in Southwest England (Launceston Castle, Exeter, Okehampton Castle and Bristol Castle). The bones found at Bristol Castle were excavated from unstratified, Post-Medieval deposits and were probably residual from an earlier (Medieval) phase of occupation. The bones from all four sites are almost certainly the remains of birds that were eaten by their respective inhabitants in the Middle Ages but their origin is something of an enigma. They could have been locally sourced from Lundy Island, off the coast of North Devon, where a gannetry existed as early as the thirteenth century and died out in 1903 (Davis & Jones 2007, Gurney 1913). It seems more likely that they were harvested and imported from one of the larger,

long-established colonies in Scotland, probably Bass Rock, Ailsa Crag or Sula Sgeir which are first mentioned in the fourteenth century. In order to be transported over such long distances the carcasses would have been partially dismembered and salted-down to preserve them.

The gannet is currently an uncommon storm-driven visitor to the Bristol Region, mainly in spring and summer. The earliest record refers to one caught alive at Weston-Super-Mare on 20 June 1856 (Anon. 1856). Another was found dead at Radstock in 1872 (Turner 1913) and four or five were seen on Denny Island on 3 September 1893 (Anon. 1899). During the first half the twentieth century there were occasional sightings of both living and dead birds from Weston, Sand Bay and Severn Beach. From there on the number of records increase dramatically, no doubt the result of regular seawatching by ornithologists along the coast. After strong south-westerly gales storm-driven birds have been blown well inland. These have appeared at several widely scattered localities but most have been observed at Chew Valley Lake which has thirteen records between 1962 and 2007. It is also possible that the bones from the archaeological sites mentioned above were the remains of birds that occurred as 'wrecks' and were taken opportunistically.

Manx Shearwater *Puffinus puffinus*

The Manx Shearwater has been found at over thirty archaeological sites in Britain, with a similar pattern of distribution to that of the Gannet Yalden & Albarella 2009, D.Yalden *pers.comm.*). The bird bone assemblages from the Bristol and Launceston Castle sites include remains of this species. Most of the shearwater bones excavated at Launceston are from late thirteenth century deposits and consist entirely of hind-limb elements. Albarella & Davis (1996), citing *Inquisitions P.M. IX. 100,22 Edward III for 1337* (*per* Steve Parry) suggest that these birds could have come from the Isles of Scilly. Edward III, as Earl of Cornwall, leased these islands to the Abbot of Blancminster for 'half a mark or CCC [300] pouffons' per annum. Early fourteenth century accounts refer to the Scilly Isles as a major source of young shearwaters, which were known as puffins. In August, when fat and heavy, they were hauled out of their burrows with an iron hook, salted-down and barrelled. The preserved carcasses could then be butchered, boiled and eaten at a later date (Brooke 1990). It is possible that the shearwater bones excavated from Bristol Castle originated from this source.

The Manx Shearwater is an uncommon summer and autumn visitor to the Bristol Region, usually storm-driven, but large feeding flocks have occurred in calm, anti-cyclonic weather conditions. The earliest record refers to 'several' seen off Avonmouth in June 1897 (Anon. 1899). Around thirty were present in the Bristol Channel, between Weston and Steep Holm, on 1 July 1928 and the same number were observed near Flat Holm on 29 July 1930. One was picked up at Clutton on 18 September 1935.

As already discussed in the species account for the gannet, the number of records increase incrementally from the middle of the twentieth century, with some sizable flocks seen in the estuary from well-watched sites along the coast. Storm-driven individuals also occur inland - Chew Valley Lake, for example, has five records of living birds. There is one celebrated record of a bird that was found alive at Claverton in September 1953 and kept in captivity until March 1954 (King 1977). Another was picked up on the outskirts of Bath in October 1955 and held in captivity until the end of that year. The remains of birds killed by Peregrine Falcons *Falco peregrinus* have been discovered at Tollgate House, in central Bristol, on 26 September 1995 and in Bath on 23 September 2007. Again, shearwaters grounded during strong south-westerly gales could have been taken opportunistically in the Middle Ages.

Conclusions

From the archaeological evidence alone it seems that seabirds and marine mammals were exploited as a source of food in Medieval Bristol. They were eaten at the wealthier households in the city, including Bristol Castle. Sixteenth century documentary sources mention the fact that seal and porpoise meat were shipped in from elsewhere in Britain, Ireland and even continental Europe. However, recent historical records show that some species occur fairly frequently in our area and could, therefore, have been locally sourced during the Middle Ages. Gannets and Manx Shearwaters were harvested at their breeding grounds or found inland after strong south-westerly gales. Cetaceans may have been stranded on the coast, taken in fishing nets as accidental bycatch or captured in the tidal lower reaches of the River Avon. Seals could have been obtained by similar means or hunted when coming ashore to give birth. Looking at the bigger picture, seabirds and, to a lesser extent, cetaceans have been found at other archaeological sites in Southwest England. Their presence at the regional administrative centres of Launceston Castle, Okehampton Castle, Exeter and Bristol Castle suggest that a long-established overland trade route once existed with links to Lundy and the Scilly Islands. Perhaps the only comparable faunal assemblages in England come from several archaeological sites in Anglo-Scandanavian and Medieval York. These include seal, Common Guillemot *Uria aalge* and Razorbill *Alca torda.* Exeter has also produced one of the few records of Black-legged Kittiwake *Rissa tridactyla*, an unidentified auk and a diver *Gavia sp.* Outside of Scotland and Northern England, the seasonal exploitation of seabirds and marine mammals appears to have been a highly localised phenomenon in other parts of Britain.

Also highlighted in this paper is the fact that many Medieval cookery books are strangely silent on the subject of recipes for Seal and Dolphin meat. There are, however, several for that of the Porpoise, suggesting that this was a generic term used to describe any small cetacean or pinniped that appeared on the menu at a Medieval banquet. Seals, cetaceans, Barnacle Geese, puffins and beavers were classed as 'honorary fish' because, it was believed, their lives began in the sea or in a river. Such strong, often fishy-flavoured meats would have been an acquired taste but a welcome source of protein during the designated religious 'fysshe days'. These, however, would have been expensive to obtain and were therefore reserved for the extravagant feasts enjoyed by the more affluent social classes. Furthermore, beached whales, dolphins and porpoises were technically the property of the king or the lord of the manor on whose land they had been discovered. Clearly, the wealth and power of the English aristocracy could be used to evade the puritanical zeal of the christian church which pervaded every aspect of social life in the Middle Ages. Some contempoaray sources recount how senior members of the clergy, counted as part of the landed gentry, were also guilty of the same dietary excesses. Thankfully, seabirds, seals and cetaceans are now cherished and protected as valuable natural assets and no longer regard3ed as ingredients for some exotic Medieval dish.

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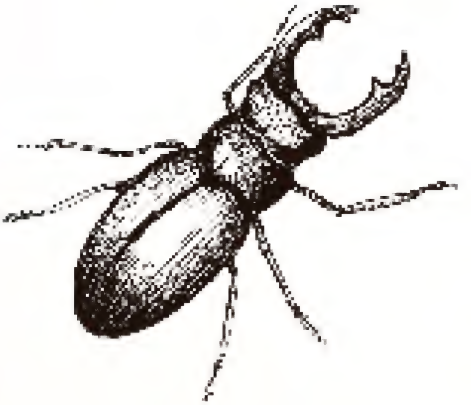
The following periodicals were searched for records of Northern Gannet, Manx Shearwater and marine mammals:

Avon Bird Report 1983-2008.
Proceedings of the Bristol Naturalist's Society 1936-2008.
Report on Somerset Birds. Duplicated typescript 1911-1923, printed 1924-1960, thereafter renamed *Somerset Birds* 1961-1977.



BRISTOL & DISTRICT INVERTEBRATE REPORT, 2009

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INTRODUCTION

2009 saw a fairly cold start to the year in January (compared to many winters over the last ten years) and at the time it was interesting to speculate on whether this might impact on the populations of species new to the area, particularly those whose populations have expanded into our region from southern England. As it happened there did not seem to be any discernible change but with few invertebrate recorders (as always) this is an opinion based solely on a subjective feeling rather than evidence based. In late October there was a rather mild spell with warm air direct from the Iberian peninsular, but at the end of the year the 21 December 2009 saw the start of a cold and snowy winter, the like of which we had not seen for some time. Consequently, it may be that the summer of 2010 may reflect these two colder winters in terms of any impact on the invertebrate fauna.

Despite the cold start to 2009 there was a remarkably early record of an adult Rose Chafer beetle (*Cetonia aurata*) from a pavement in St Andrews, north Bristol on 23 February by Roger Edmondson. As so often happens with this species the record relates to an example found squashed, being slow moving and associated with parks and plant beds unfortunately they regularly succumb to the footfall of passers by. Other surprisingly early records included the Dotted Bee-fly (*Bombylius discolor*) in Newton-St-Loe, Bath on 24 March (Mike Williams) and a Small White butterfly (*Pieris rapae*) on 17 March, Brandon Hill, Bristol (Mary Wood).

After several years of very low numbers of sightings of the Small Tortoiseshell butterfly (*Aglais urticae*) there seemed to have been a recovery judging by the number of reports of butterflies appearing out of hibernation in the spring.

The publication of *Moths of the Bristol Region* provided moth recorders with a yardstick by which to judge the significance of their sightings. One record from 2007 was reported which was a species new to the region and therefore omitted from the book, namely *Dichomeris alacella* recorded by Paul Chapman at Walton Common, North Somerset on 10 August 2007 and determined by James McGill. In addition, during 2009, *Cochylis molliculana* was recorded new to the region by John Martin. A second species of great interest in this year was the discovery of emergence holes in poplars at the University of Bath and from central Bath of the Hornet Moth (*Sesia apiformis*). By Chris Iles. No other confirmed records had been received since the 19th C.

Other moth sightings from 2009 included the early spring species *Tortricodes alternella* which is poorly recorded in the region probably because it appears so early in the year. Notable was the abundance of the Scarlet Tiger moth (*Callimorpha dominula*) which has now probably replaced the Cinnabar (*Tyria jacobaeae*) as the most commonly seen red and black day-flying moth in and around Bristol, a remarkable transformation. The Small Ranunculus moth (*Hecatera dysodea*) and Cypress Carpet moth (*Thera cupressata*), both of which have only recently colonised the region, had good seasons with the larvae of the former being relatively easy to find on waste ground in Bristol. Migrant moths were few in number but one possible Convolvulus Hawk-moth (*Agrius convolvuli*) was reported from Stoke Bishop on 6 August 2009 by Harvey Rose. In contrast, the early part of the year saw a very substantial invasion of the Painted Lady butterfly (*Vanessa cardui*) but expectations for very large numbers to appear in the summer were not met. Clouded Yellow butterfly (*Colias croceus*) sightings were very few. The only other noteworthy record of butterflies was perhaps the lack of sightings of the Small Blue (*Cupido minimus*) in the Avon Gorge. No doubt this elusive species is still present and will repay diligent searching.

Harlequin Ladybirds (*Harmonia axyridis*) seemed in low numbers in spring and summer but then there were a lot of reports of hibernating groups in the early winter (no doubt due to its habit of hibernating in houses).

Chris Iles in Midsomer Norton noted the absence of sightings of the large hoverfly *Volucella inanis* despite it having been common in 2008, perhaps this was one example of a consequence of the harder winter?

A new initiative in 2009 was the inaugural 'Bioblitz' organised by the Bristol Natural History Consortium (who are also responsible for the annual Festival of Nature amongst other things). Over Friday and Saturday 26/27 June local naturalists were joined by others from further a field at Ashton Court in an attempt to record as many different species of fauna and flora as possible. Naturally insect species made up a considerable percentage of the final total including 6 species of biting midge, 7 species of springtail and 7 species of bark lice for which no previous records were held on the BRERC database. In 2010 the 'Bioblitz' will move to the Blaise Estate and no doubt will also reveal new species.

My thanks to all who have submitted records directly to the Society (particularly to Robert Cropper, Paul Chadwick, Edward Niblett, Jon Mortin, Andy Pym and John Burton) the Bristol Regional Environmental Records Centre (BRERC) and to the Bristol Wildlife E-group. The importance of receiving, not just the records picked out here, but those of perhaps less noteworthy species cannot be understated in terms of monitoring the ever changing status of the invertebrate fauna.

Scientific nomenclature follows that used by the National Biodiversity Network website (www.nbn.org.uk).

Species of note in 2009

ANNELIDA

Red Worm *Lumbricus rubellus* Hoffmeister Ashton Court, N. Somerset (vc 6) ST553 718 27 June 2009 David Jones. Recorded as part of the 'Bioblitz'.

CRUSTACEA

Grass Shrimp (*or* Common Ditch Shrimp) *Palaemonetes varians* (Leach) Severn Way, Sea Mills, Bristol (vc 34) ST550753 summer 2009 Jon Mortin, 3rd record for BRERC region, a group which are often overlooked or ignored.

INSECTA

Collembola (springtails)

Tomocerus longicornis Muller Ashton Court, N. Somerset (vc 6) ST554 717 27 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Orchesella cincta (Linnaeus) Ashton Court, N. Somerset (vc 6) ST554 717 27 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Orchesella villosa (Linnaeus) Ashton Court, N. Somerset (vc 6) ST554 717 27 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Entomobrya albocincta (Templeton) Ashton Court, N. Somerset (vc 6) ST554 717 26 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Entomobrya nivalis (Linnaeus) Ashton Court, N. Somerset (vc 6) ST554 717 27 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Lepidocyrtus cyaneus Tullberg Ashton Court, N. Somerset (vc 6) ST555 722 26 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Ptenothrix atra (Linnaeus) Ashton Court, N. Somerset (vc 6) ST554 717 27 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Psocoptera (barklice, booklice)

Loensia fasciata (Fabricius) Ashton Court, N. Somerset (vc 6) ST554 720 27 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Loensia variegata (Latreille) Ashton Court, N. Somerset (vc 6) ST555 719 26 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Graphopsocus cruciatus (Linnaeus) Ashton Court, N. Somerset (vc 6) ST555 719 26 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Stenopsocus immaculatus (Stephens) Ashton Court, N. Somerset (vc 6) ST548 720 26 June 2009 Tom Mitchell and Ashton Court, N. Somerset (vc 6) ST555 722 26 June 2009 David Scott-Langley both recorded as part of the 'Bioblitz'.

Ectopsocus briggsi (McLachlan) Ashton Court, N. Somerset (vc 6) ST554 720 27 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Elipsocus pumilis (Hagen) Ashton Court, N. Somerset (vc 6) ST555 719 26 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Philotarsus parviceps Roesler Ashton Court, N. Somerset (vc 6) ST555 719 26 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Hemiptera (true bugs)

Tortoise Bug *Eurygaster testudinaria* (Geoffroy) Worley Hill, Somerset (vc 6) ST497 310 6 September 2009 Robert Cropper one in rough grass. A local species across southern England that appears to be increasing.

Chilacis typhae (Perris) Chilton Moor, Somerset (vc 6) ST37 43 11 October 2009 Robert Cropper, a few on *Typha latifolia*. A species thinly scattered across England.

Western Conifer Seed Bug *Leptoglossus occidentalis* Heidemann University of Bristol Biological Sciences Dept, Bristol (vc34) ST581 733 18 September 2009 Nic Charlton. A large and impressive North American species first found in continental Europe in 1999, first records from the UK were of individuals on the south coast in 2008, likely to be come established on pine trees. This example was found inside a building.

Dicranocephalus medius (Muls. & Rey) Leigh Woods, Nightingale Valley, N. Somerset (vc 6) ST561 731 26 April 2009 Ray Barnett, swept from wood spurge, few records in our region and a Nationally Scarce species.

Corixa dentipes (Thomson) Westhay Moor NNR, Somerset (vc 6) ST457 441 3 October 2009 Robert Cropper, small numbers in lake. Although found over much of England, Scotland and Wales, this species is very unusual in the south west.

Issus coleoptratus (Fabricius) Leigh Woods (The Plain), North Somerset (vc 6) ST556 732 30 August 2009 Ray Barnett, swept. A local species which has been regularly recorded at this site over several years.

Raphidioptera
Xanthostigma xanthostigma (Schumm.) The Gully, Avon Gorge, Bristol (vc 34) ST564 746 10 May 2009 Ray Barnett, one swept. Snakeflies seem to be genuinely rare in our region even accounting for the suggestion that they spend much of their adult lives at the tops of trees. This species is more commonly founding the Midlands, East Anglia and northern England. Larvae are predatory under bark.

Lepidoptera (butterflies)
Clouded Yellow *Colias croceus* (Geoffroy) Tickenham Moor, North Somerset (vc 6) ST4 7 7 August 2009 Des Bowring 6 seen; Chew Valley Lake, Bath & NE Somerset (vc 6) ST5 5 9 August 2009 Rupert Higgins 1 individual. Very few sightings of this immigrant this year.

Chalkhill Blue *Lysandra coridon* (Poda) The Gully, Avon Gorge, Bristol (vc 34) ST564 746 various dates between 8 July and 8 September 2009 Hugh Welford. Largest count was 18 individuals on 7 August. This colony holding its own, following its rediscovery in 2007.

Small Blue *Cupido minimus* (Fuess.) Odd Down Park & Ride, Bath & N E Somerset (vc 6) ST735 617 date not specified 2009 Chris Iles, population doing well. An elusive species to record with a small sprinkling of colonies through out the region, one at least (in S Gloucestershire) at risk from building development.

Small Pearl-bordered Fritillary *Boloria selene* (D. & S.) South side of Cheddar Gorge, Somerset (vc 6) ST4 5 date not specified Chris Iles, a couple seen. Still a very localised and rare species in the region.

Zebra Longwing *Heliconius charithonia* (L.) Clifton, Bristol (vc 34) ST5 7 late August 2009 Mark Brierly (det. Ray Barnett). This butterfly, native to the southern USA is long lived in captivity and hence a favourite in butterfly houses. This individual was presumably an escapee from the butterfly house in Bristol Zoo Gardens.

Lepidoptera (micro-moths)
Coleophora ochrea (Haw.) The Gully, Avon Gorge, Bristol (vc 34) ST564 746 1 August 2009 Ray Barnett, one imago swept. A very localised species which is holding its own in the Avon Gorge, breeding on Common Rock-rose *Helianthemum chamaecistus.*

Cochylis molliculana Zell. Pilning, South Gloucestershire (vc 34) ST556 849 19 August 2009 John Martin. New to the region and not recorded in *Moths of the Bristol Region.*

Tortricodes alternella (D. & S.) Sneyd Park, Bristol (vc 34) ST55 75 Martin Evans and Roger Edmondson 25 February at light. Walton Common, N. Somerset (vc 6) ST47 20 February 2009 Paul Chapman and Howard Taffs. An early flying species so very poorly recorded and its true status – local or common - is unclear.

Gynnidomorpha alismana (Ragonot) Pilning, South Gloucestershire (vc 34) ST556 849 6 August 2009 John Martin the only known site in the region for this species.

Calamotropha paludella (Hb.) Pilning, South Gloucestershire (vc 34) ST556 849 1 July 2009, 2 July 2009, 10 August 2009 John Martin. Scattered across the region but the populations seems to rise and fall regularly.

Phlyctaenia perlucidalis (Hb.) Pilning, South Gloucestershire (vc 34) ST556 849 25 June 2009 John Martin. Only known from this site in the region.

Lepidoptera (macro-moths)

Hornet Moth *Sesia apiformis* (Clerk) University of Bath campus, Bath & N E Somerset (vc 6) ST77 64 date not specified Chris Iles – emergence holes in poplars. This species has not been confirmed in the region since the 19th C.

Small Eggar *Eriogaster lanestris* (Linnaeus) River Axe, Uphills, Somerset (vc 6) ST313 579 20 June 2009 Robert Cropper. Larval web on Blackthorn *Prunus spinosa*, a nationally local species with a stronghold along the coastline of this region.

Fox Moth *Macrothylacia rubi* (L.) Burrington Combe, N. Somerset (vc 6) ST45 1 September 2009 John Martin, two larvae seen. In the Bristol region a very localised species but also recorded from Dolberrow on Mendip.

Orange Underwing *Archiearis pathenias* (L.) Rowberrow, N. Somerset (vc 6) ST46 56 5 April 2009 Nigel Milbourne, possibly a first record for Mendip?

Chalk Carpet *Scotopteryx chenopodiata* (L.) Uphill, North Somerset (vc 6) ST316 582 11 August 2009 John Martin. Leigh Woods/Avon Gorge, Bristol (vc 6) ST57 23 June 2009 John Martin.

Cypress Carpet *Thera cupressata* (Geyer) Pilning, South Gloucestershire (vc 34) ST556 849 21-29 June 2009 and again 7 September – 30 October 2009 John Martin. This species increases year on year after arriving in the region in 2006.

Ocherous Pug *Eupithecia indignata* (Hb.) Pilning, South Gloucestershire (vc 34) ST556 849 14 May 2009 John Martin (gen. prep. M. Bailey). Although nationally common, we have few confirmed records of this species for which genitalia preparation is advisable.

Brussels Lace *Cleorodes lichenaria* (Hufn.) Dundry, N. Somerset (vc 6) ST5 6 27 July 2009 Dave Nevitt. A very rare species in the Bristol region with just one previous post-1940s record (2006 in Whitchurch) although seen in south Somerset regularly.

Small Ranunculus *Hecatera dusodea* (D. & S.) Government Building, Westbury-on-Trym, Bristol (vc 34) ST575 783 28 July 2009 John Martin, larva on Prickly Lettuce *Lactuca serriola*.

Dusky-lemon Sallow *Xanthia gilvago* (D. & S.) Pilning, South Gloucestershire (vc 34) ST556 849 22 September 2009 John Martin. Not noted in the region since the early 1990s, an excellent record and a species worth looking out for elsewhere.

Ni Moth *Trichoplusia ni* (Hb.) Dundry, N. Somerset (vc 6) ST56 4 August 2009 Dave Nevitt. A very rare immigrant to the Bristol region but easily overlooked as very similar to the Silver Y *Autographa gamma*.

Pinion-streaked Snout *Schrankia costaestrigalis* (Stephens) Pilning, South Gloucestershire (vc 34) ST556 849 30 June 2009 John Martin. A local species more often recorded south of Bristol.

Coleoptera (beetles)
Anotylus rugosus (Fabr.) Burnham-on-Sea, Somerset (vc 6) ST310 491 6 Oct 2009 Robert Cropper one landed on car. A rove beetle, widespread, seldom reported.

Aphodius obliteratus Panz. Brean Down, Somerset (vc 6) ST2958 8 November 2009 Robert Cropper, one from cow dung. According to Duff (1993) a local species found usually on higher ground and usually associated with horse dung.

Adrastus pallens (Fabricius) Ashton Court, N. Somerset (vc 6) ST555 719 26 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'. A local and scarce click beetle across England with just one or two previous records from the region.

Metoecus paradoxus (L.) 85 Cornwall Road, Bishopston, Bristol (vc 34) ST585 757 23 July 2009 James Barnett, one found on garden path. This distinctive species, with its black and red colouration, feathery antennae and sickle shaped wing cases, is rarely seen as it spends a large part of its life cycle within social wasp nests.

Mordellistena pumila (Gyllenhal) Ashton Court, N. Somerset (vc 6) ST555 719 26 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'. A local and scarce tumbling flower beetle.

Phymatodes testaceus (Linnaeus) Ashton Court, N. Somerset (vc 6) ST555 719 26 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'. 2nd record of this very local species of old oaks in the BRERC database.

Cryptocephalus bipunctatus (Linnaeus) The Gully, Bristol Downs ST564 746 (vc 34) 23 May 2009 Ray Barnett. Seen for a third year at this site. (**Nationally Notable - Nb**)

Cryptocephalus pusillus Fabr. Leigh Woods (The Plain), North Somerset (vc 6) ST556 732 30 August 2009 Ray Barnett. A diminutive species and therefore probably overlooked.

Platyrhinus resinosus (Scop.) The Gully, Avon Gorge, Bristol (vc 34) ST564 746 10 May 2009 Ray Barnett.

Tropiphorus elevatus (Herbst) Leigh Woods, Nightingale Valley, N. Somerset (vc 6) ST561 731 26 April 2009 Ray Barnett, one swept. This fairly large weevil is very localised over the country and there are no previous recent records from the region.

Hymenoptera (bees, wasps and ants)
Macropis europaea Warncke Shapwick Heath NNR, Somerset (vc 6) ST424 408 8 August 2009 Robert Cropper, 2 females visiting Yellow Loosestrife *Lysimachia vulgaris* flowers.

Hairy Sand Wasp *Podalonia hirsuta* (Scopoli) Ashton Court, N. Somerset (vc 6) ST555 715 27 June 2009 Institute for Animal Health. Recorded as part of the 'Bioblitz' by a visiting team from the IAH. 1st record of this species in the BRERC database. Mainly a species of the English and Welsh coasts.

Hornet *Vespa crabro* L. Leigh Woods, N. Somerset (vc 6) ST554 733 19 September Ray Barnett, 16 in one moth trap. Leighton Hanging, Somerset (vc 6) ST705 444) 31 August 2009 Robert Cropper queen flying in open rocky grassland. The Gully, Avon Gorge, Bristol (vc 34) ST56 74 19 August 2009 John Martin. Weston Big Wood, North Somerset (vc 6) ST47 3 June 2009 John Martin. Records which reflect the substantial increase in distribution and abundance of the hornet in recent years.

Bombus hypnorum (L.) Silver Street LNR, Midsomer Norton, Bath & N E Somerset (vc 6) ST6 4 18 July 2009 Chris Iles. A relatively new colonist to the country and recorded in 2008 at Bath and Westonbirt in our region, it is likely to be well established.

Diptera (true flies)
Culicoides achrayi Kettle & Lawson Ashton Court, N. Somerset (vc 6) ST552 719 26 June 2009 Institute for Animal Health. Recorded as part of the 'Bioblitz' by a visiting team from the IAH. 1st record of this species in the BRERC database.

Culicoides dewulfi Goetghebuer Ashton Court, N. Somerset (vc 6) ST552 719 26 June 2009 Institute for Animal Health. Recorded as part of the 'Bioblitz' by a visiting team from the IAH. 1st record of this species in the BRERC database.

Culicoides obsoletus (Meigen) Ashton Court, N. Somerset (vc 6) ST552 719 26 June 2009 Institute for Animal Health. Recorded as part of the 'Bioblitz' by a visiting team from the IAH. 2nd record of this species in the BRERC database.

Culicoides pulicaris (Linnaeus) Ashton Court, N. Somerset (vc 6) ST552 719 26 June 2009 Institute for Animal Health. Recorded as part of the 'Bioblitz' by a visiting team from the IAH. 1st record of this species in the BRERC database.

Culicoides punctatus (Meigen) Ashton Court, N. Somerset (vc 6) ST552 719 26 June 2009 Institute for Animal Health. Recorded as part of the 'Bioblitz' by a visiting team from the IAH. 1st record of this species in the BRERC database.

Culicoides scoticus Downes & Kettle Ashton Court, N. Somerset (vc 6) ST552 719 26 June 2009 Institute for Animal Health. Recorded as part of the 'Bioblitz' by a visiting team from the IAH. 1st record of this species in the BRERC database.

Eupeodes nitens (Zett.) Ashton Court, N. Somerset (vc 6) ST555 720 27 June 2009 Jenni Rogers. Recorded as part of the 'Bioblitz'. 1st record of this species in the BRERC database, known from a couple of records in south Somerset, usually associated with open ancient deciduous woodland.

Myriapoda (millipedes, centipedes)
Lithobius crassipes L. Koch Ashton Court, N. Somerset (vc 6) ST555 722 26 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

Proteroiulus fuscus (Am Stein) Ashton Court, N. Somerset (vc 6) ST554 720 27 June 2009 David Scott-Langley. Recorded as part of the 'Bioblitz'.

BRISTOL & DISTRICT REPTILES & AMPHIBIA REPORT, 2009

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For many years now the 'Biota' reports within this publication have covered taxa which reflect the various 'Sections' of the Society which deal with the living biology, namely Botany, Mammals and Invertebrates (Ornithology being covered by the separate publication the Avon Bird Report). This coverage, although substantial and very important, omits some species of significance and interest. In particular it provides no information on the so called 'lower' vertebrates ie the fish, reptiles and amphibians. There are undoubtedly organisations which hold information on these groups eg the Environment Agency, angling groups with regard to the fish and the Avon Reptile and Amphibia Group (ARAG) with regard to those two groups. These bodies (with the exception of angling clubs) have direct links to BRERC - the Bristol Regional Environmental Records Centre, which collates the records received and makes them available to bona fide enquirers. ARAG produces a newsletter for its members but perhaps in future the BNS could also play a greater role in generating information on these organisms and in publicising their status.

Currently, anecdotal evidence would suggest that this region has good populations of Common Frog *Rana temporaria*, Common Toad *Bufo bufo* and Smooth Newt *Lissotriton vulgaris*. Great-crested Newt *Triturus cristatus* is widespread if local as is the Palmate Newt *Lissotriton helveticus* the latter perhaps reflecting a slight preference for more acidic waters. On the Somerset Levels can be found an introduced population of 'green frogs' although there seems some debate over the exact identity and occurrence as the Marsh Frog *Pelophylax ridibundus,* Pool Frog *Pelophylax lessonae* and Edible Frog *Pelophylax esculentus* all appear very similar to each other. Certainly their characteristic vocal calling can make parts of the Moors and Levels sound more reminiscent of continental Europe than England.

Slow worm *Anguis fragilis* is common and regularly found in city gardens in Bristol, for example. Common Lizard *Zootoca vivipara* is harder to find but also probably widespread and not uncommon. Grass Snake *Natrix natrix* is not commonly encountered and neither is Adder *Vipera berus* although there are known populations for example to the south west of Bristol and further south on Mendip.

Members of the Bristol Naturalists' Society can contribute to the understanding of the status of these species by submitting sightings direct to the recorders above or to BRERC.

BRISTOL MAMMAL REPORT 2009

Compiled by David P. C. Trump
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INTRODUCTION

The intention of this mammal report is to be a wide-ranging review of the records and studies of mammals in and around the Bristol area and to report on significant issues and events affecting British mammals in 2009. The former county of Avon covers an area of approximately 1300 square kilometres, and so the number of 1 km squares for which records have been received gives an indication of the abundance of each species. The more common species are likely to be under-recorded. Where given, all grid references are for the 100 km grid square ST. The differences between the years are likely to be due to changes in numbers and locations of recorders rather than changes in mammal abundance or distribution. Provided the submitter of a record gives permission, all records are submitted annually to the Bristol Regional Environment Records Centre (BRERC).

The sequence of Orders, Families Genera and Species now follows current thoughts on evolution and phylogeny. Polecat records show a slight increase suggesting that the spread continues. Lowest number of road casualty records (since detailed records were collated in 1996) and second lowest number of 1 km squares indicating that something is going wrong for the poor old hedgehog. There was a report of a Minke Whale stranded in the River Parrett – not quite in 'Avon' but none-the-less worth reporting. The Water Vole is now known as *Arvicola aquaticus*.

REPORTS ON MAMMALS

Rodents: Order Rodentia

Grey squirrel *Sciurus carolinensis*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	77	50	37	59	62	83	60	68	53	34

Records from RLB, RB, PC, JMa, JM, EN, S&JP, JR, DT, MT.

The smallest number of 1-km squares recorded. This is likely to be because they are under-recorded as Richard Bland's Clifton Downs Grey Squirrel counts, summarised in figure 1 below, suggest variation rather than decline.

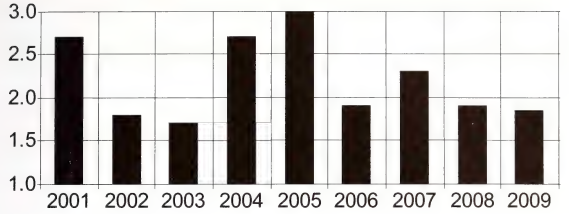


Figure 1. Average Grey Squirrel count on a standard walk across Clifton Downs.

Hazel dormouse *Muscardinus avellanarius*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	?	0	1	1	0	0	5+	2	1	2

Records from HB, GB.

Gill Brown found shredded honeysuckle bark in Dormouse nest boxes in Towerhouse Wood (4771) in November.

Hannah Broughton reported on her Dormouse box checks at Leigh Woods (5574). There are now 40 nest boxes in place and Dormice appear to be much in evidence! 29 of the 40 boxes had been occupied by Dormice by the end of November 2009 (see figure 2).

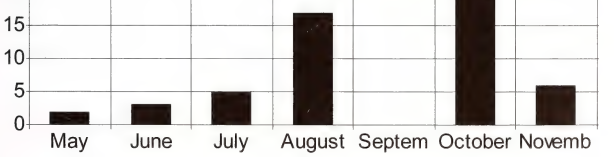


Figure 2. Numbers of Dormice found in nest boxes at Leigh Woods (2009).

Bank vole ***Myodes glareolus***

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	4	1	6	5	1	3	3	5	2	0

No records for the year.

Field vole ***Microtus agrestis***

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	2	2	7	5	1	3	4	1	2	2

Records from JB, JR.

Water vole ***Arvicola aquatica***

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	2	2	2	1	2	4	0	1	1

Record from (no name given).

One seen swimming in a rhyne at Portbury Wharf (4977) in March.

Harvest mouse ***Micromys minutus***

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	1	0	0	0	1	1	0	0	0

No records for the year.

Wood mouse ***Apodemus sylvaticus***

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	6	7	5	9	3	7	5	9	4	7

Records from HB, JM, EN, S&JP, JR, DW.
The majority of records were from under garden bird feeders or in houses!

Yellow-necked mouse ***Apodemus flavicollis***

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	0	1	0	0	0	0	0	0	0

No records for the year.

House mouse ***Mus domesticus***

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	3	4	1	3	1	3	2	1	1	1

Record from JR.

Common rat *Rattus norvegicus*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	17	6+	13	9	9	7	6	8	5	7

Records from CMBH, JM, JR, DT, DW.

'Invasion of the super rats – stronger, faster.....and resistant to poison' (headline in the *Bristol Evening Post*, 16 May). Researchers at Huddersfield University have found a 'poison resistant gene' in rats from Bristol and Swindon. A Bristol City Council spokesperson reported that the council's pest control team dealt with around 5,000 rat infestations in the city in 2008 but had not had any problems with resistance to the baits they used.

'Duck feeding attracts rats' (*Bristol Evening Post*, 23 May). Visitors to Summer Lane Park in Weston-super-Mare were being encouraged to stop feeding the ducks in the park by environmental health officers. The council reported that the numbers of rat infestations they dealt with in 2008 was 1,708, down from 2,123 cases in 2007.

Rabbits and Hares: Order Lagomorpha

Rabbit *Oryctolagus cuniculus*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	105	19	36	52	68	76	48	23	36	50

Records from RLB, RB, PC, KG, CMBH, EN, S&JP, JM, JR, DT, MJT.

'Mystery of missing roundabout bunnies' (*Bristol Evening Post*, 5 September). Animal lovers in Bradley Stoke were reported to be distraught over the disappearance of the Rabbits from a roundabout at the junction of Bradley Stoke Way and Winterbourne Road. Up to 20 rabbits used to live on the roundabout but numbers dwindled during the summer. The reason for their disappearance is unknown, but sighting of a Fox in the vicinity and a Fox found dead on a nearby road suggest that a Fox may have been responsible. A spokesperson for South Gloucestershire Council said that they had not undertaken any recent works at the roundabout apart from regular grass cutting.

Brown Hare *Lepus europaeus*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	34	11	10	24	6	10	12	10	2	6

Records from RLB, CMBH, EN, S&JP, DT, DW.

All records were of individual animals apart from two seen at Marshfield (7875) in February. Individuals seen at Belmont House (5170) and Breach Wood (4973) in January, Villice Parkland (5559) and Clapton Moor (4573) in April, West Littleton (7574) in July and Heron's Green (5559) in September.

The March edition of *BBC Wildlife* Vol. 27 (3) featured the Brown Hares of the Somerset Levels studied by Nancy Jennings of Bristol University. Cattle grazed pasture and fallow land were the favoured habitat of the Hares in the summer months with arable crops being the preferred winter habitat.

Insectivores: Orders Erinaceomorpha and Soricomorpha

Hedgehog *Erinaceus europaeus*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	97	38	45	26	26	39	14	24	17	16

Records from GB, DM, JMa, EN, JR, DT, LT, MT, DW.

Data collected by BNS members again shows a decline in the number of Hedgehog road casualties. There were only 15 road casualty records in 2009, the lowest since records were first collected in 1996.

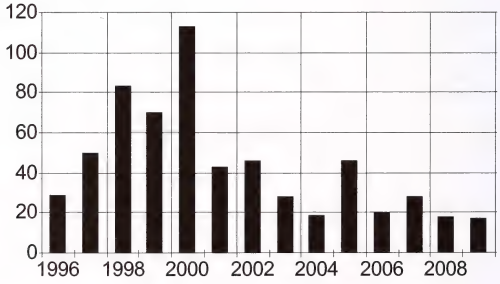


Figure 3. Number of Hedgehog Road Casualty Records 1996-2009.

'Rat poison threat to hedgehogs' (*Bristol Evening Post*, 27 August); 'Hedgehogs killed by rat poison' (*BBC News website*, 27 August). New research at Bristol University has revealed the presence of anticoagulants, used in rodenticides, in 'significant levels' in Hedgehogs. 80 out of 120 Hedgehog carcases examined had been exposed to rodenticides. How the Hedgehogs came to have the rodenticide residues in their bodies is uncertain but Dr Claire Dowding speculated that they could have eaten baits directly or have scavenged on dead rodents or on slugs and snails that had themselves eaten rodenticides. A spokesperson from the RSPCA said 'The findings of the study mean that we ensure these poisons are used with even greater care. Because they are widely available and the most common form of rodent control, we would urge people to bear in mind the wider problems these are now thought to cause, and use them responsibly'.

Mole *Talpa europea*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	151	69	63	56	63	90	71	81	80	85

Records from RLB, PC, KG, EN, JR, DT.

The vast majority of records were of Mole hills, generally the only evidence that they are present in a particular area.

Common Shrew *Sorex araneus*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	1	3	4	5	2	6	6	3	2	2

Records from EN, JR.

Pygmy Shrew *Sorex minutus*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	0	4	6	0	0	0	1	0	1

Record from JM.

Water Shrew *Neomys fodiens*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	0	2	2	2	0	1	0	0	1

Record from DW.

One found dead in the nest of a Coot at Nunnery Point, Chew Valley Lake (5659) in June.

Greater Horseshoe Bat *Rhinolophus ferrumequinum*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	5	0	1	1	0	1	0	0	1

Record from JR.

Lesser Horseshoe Bat *Rhinolophus hipposideros*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	3	0	9	4	0	7	0	1	0	2

Records from ABG, DT.

Bat detector, droppings and sight records when up to 70 were counted out of the roost at Tyntesfield (5071) in July.

Whiskered Bat/Brandt's Bat *Myotis mystacinus/brandtii*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	0	1	1	0	0	0	0	0	2

Records from ABG, DT.

Bat detector record from Tyntesfield (5071) in July and Avon Bat Group Bat Box survey.

Daubenton's Bat *Myotis daubentoni*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	1	2	0	2	0	0	0	0	0

No records for the year.

Natterer's Bat *Myotis nattereri*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	3	1	3	0	1	0	0	0	0	1

Record from ABG (see Bat Box report below).

Bechsteins Bat *Myotis bechsteinii*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	0	1	1	0	0	1	0	0	1

Record from ABG (see Bat Box report below).

Leisler's Bat *Nyctalus leisleri*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	1	0	0	0	0	0	0	0	0

No records for the year.

Noctule ***Nyctalus noctula***

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	1	3	4	4	4	0	1	2	0	2

Record from ABG, DT.

Bat detector/sight record from Tyntesfield (5071) and Avon Bat Group Bat Box survey.

Common Pipistrelle ***Pipistrellus pipistrellus*****, Soprano Pipistrelle** ***Pipistrellus pygmaeus*** **and Pipistrelle sp.** ***Pipistrellus sp.***

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	3	4+	12	5	6	9	4	5	4	9+

Records from ABG, JR, DT.

Bat detector record from Tyntesfield (5071) and Avon Bat Group Bat Box survey.

Nathusius' Pipistrelle ***Pipistrellus nathusii***

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	1	0	0	0	0	0	0	0	1

Record from ABG (see Bat Box report below).

Serotine ***Eptesicus serotinus***

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	0	2	2	0	1	1	1	0	1

Records from DT.

Bat detector record from Tyntesfield (5071).

Brown Long-Eared Bat ***Plecotus auritus***

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	0	1	1	0	0	0	2	1	3

Records from ABG, DT.

Bat detector/sight record from Tyntesfield (5071) and Avon Bat Group Bat Box survey.

The Avon Bat Group reported on their very successful bat box checks in 2009 (*Avon Bat Group Newsletter no. 57,* March 2010).
. A number of sites were visited and the results are summarised as follows:-

1) Conham River Valley (South Glos Council), 12 boxes checked – no bats present. An iron culvert at the site has now been successfully grilled and the resident Brown Long-eared Bat was present again this winter.
2) Bickley Wood (South Glos Council). 18 boxes erected in November 2008. Good numbers of Soprano Pipistrelles recorded with evidence of breeding in a few boxes. Also of note was an unusually large female Whiskered Bat in one box.
3) Eastwood Farm (opposite side of the River Avon from Conham River Valley). 23 boxes on site but half missing probably due to vandalism. A single male Soprano Pipistrelle found in one box.
4) Folly Farm. 73 bats found on the second visit of the year. Boxes with maternity roosts of Brown Long-eared and Natterer's Bats (26 juveniles recorded). Small numbers of Soprano Pipistrelles, Noctules and a male Bechstein's Bat also recorded.
5) Wick Golden Valley. Bat boxes erected late in 2008. 3 male Soprano Pipistrelles found during second check. In addition a Lesser Horseshoe Bat was found in the purpose-built hibernacula.
6) Chew Valley and Blagdon Lake. Large numbers of Soprano Pipistrelles and a single Nathusius' Pipistrelle. Nathusius' Pipistrelles have been recorded regularly around the lakes but this is the first record from a bat box in the area.

Carnivores: Order Carnivora

Red Fox *Vulpes vulpes*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	71	35	39	48	38	47	43	27	24	36

Records from RLB, HB, RB, JB, PC, KG, CMBH, JM, EN, JP, S&JP, JR, DT, E&MT, DW.

'Fox attack blamed for ostrich's death' (*Bristol Evening Post*, 28 January). Olivia, an ostrich at Noah's Ark Zoo Farm, was found dead by keepers who suspected that she had been killed by a Fox.

'A lucky soft landing for this Fantastic Mr Fox' (*Bristol Evening Post*, 9 November). Staff at a leather goods shop in Weston-super-Mare were surprised when a young Fox came crashing through the ceiling and landed in a pile of leather handbags. It was rescued unharmed by a local wildlife rescue group.

'The wily old fox fights back' (*Bristol Evening Post*, 11 November). Having nearly been wiped out by mange in the 1990s, Foxes are now returning to Bristol in force. It is now estimated that there are a thousand breeding adults in the city, still only half the 'pre-mange' population.

Badger *Meles meles*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	77	42	50	31	37	48	29	56	51	49

Records from the following RLB, RB, JB, AB, KG, CMBH, JM, EN, JR, DT, MJT, LW.

Fourteen years of Badger road casualty figures with 517 records to date show a large peak around March/April (peak breeding season) with perhaps an indication of a smaller peak in September (dispersal of young) (Fig 4). There are few records between November and January. This is the time of year when Badgers are at their least active with the pregnant females underground in their setts prior to giving birth to cubs between January and March.

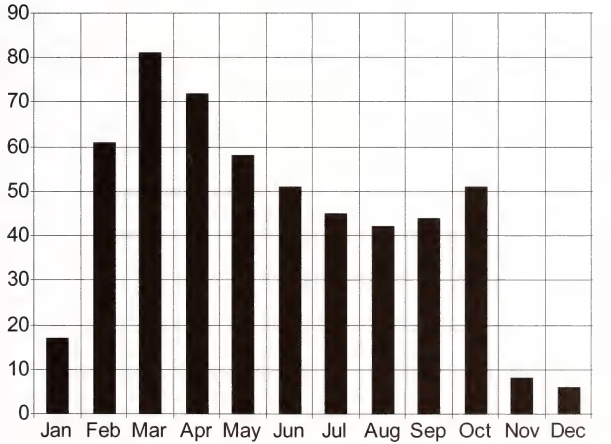


Figure 4. Number of Badger Road Casualty Records per month 1996-2009.

The road casualty data presented in a different way shows wide fluctuations in numbers with a possible upward trend from the mid 1990s to the present.

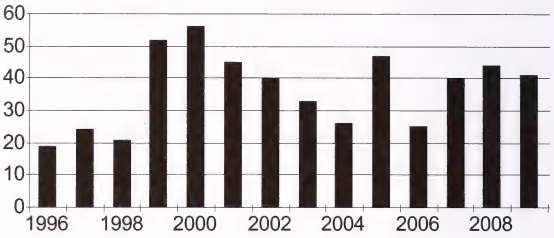


Figure 5 Road casualty badgers 1996-2009.

Since records of road casualty Badgers were collected on a regular basis (from 1996), a number of 'hot-spots' are apparent:

1–km square	Number of road casualty Badgers	Location/Notes
4169	**10**	M5 near Clevedon (the overbridge at ST414699 appears to be particularly hazardous)
4271	**10**	M5 near Clevedon Court
4971	**6**	B3130 Wraxall
4972	**6**	B3128 Wraxall
5070	**5**	B3130 Belmont
5072	**7**	B3128 Wraxall
5075	**5**	A369 Gordano
5269	**15**	A370 Cambridge Batch (Long Ashton Bypass)
5369	**11**	A370 Barrow Wood (Long Ashton Bypass)
5471	**5**	B3128 at Ashton Court
5484	**8**	A403/M49 Severn Beach
5571	**5**	A370/B3128 Long Ashton (bypass)/Bower Ashton
5585	**5**	Pilning
5662	**6**	B3114 Chew Stoke to Chew Magna
6469	**6**	A4 Keynsham Bypass
A further 11 1-km squares had 4 road casualty Badgers, 13 1-km squares had 3 road casualty badgers, 61 1-km squares had 2 road casualty badgers and 142 1-km squares had 1 road casualty badger.		

Table 1. Numbers of road casualty Badgers per 1-km square (1996-2009)

The results give an indication of the most hazardous places for Badgers (and for road users) but are likely to be biased towards the routes driven by the regular badger road casualty recorders. This is particularly true of the roads around Nailsea, the M5 and the A370 where your county mammal recorder lives.

Which were the most dangerous roads for Badgers in 2009?

Road Name/	*Location (in 'Avon')*	*2004-*	***2009***	*Total*
M32	Hambrook to centre of Bristol		**1**	1
M4	Tormarton to Second Severn Crossing	3		3
M49	Severn Beach to Avonmouth	1		1
M5	Falfield to Loxton	8	**2**	10
M48	M4 Awkley to Aust	3		3
A4	Avonmouth to Batheaston	4		4
A36	Bath to Hinton Charterhouse	2		2
A37	Temple Meads to Farrington Gurney	4	**1**	5
A38	Falfield to Churchill	7	**1**	8
A39	Corston to Hallatrow	1		1
A362	Farrington Gurney to Radstock	4		4
A368	Banwell to Marksbury	5	**1**	6
A369	Bower Ashton to Portishead	2	**4**	6
A370	Ashton Gate to East Brent	29	**2**	31
A46	Starveall to Bathampton	2		2
Old A46	Lambridge (Bath)	1		1
A403	Avonmouth to Aust	12	**2**	14
A420	Bristol to Marshfield	2		2
A4018	Bristol Centre to M5 Junction 17		**1**	1
A4174	Hick's Gate to Filton		**1**	1
B3110	Bath to Hinton Charterhouse	1		1
B3114	Chew Magna to Chewton Mendip	5	**2**	7
B3124	Clevedon to Portishead	2		2
B3128	Bower Ashton to Stone-edge-batch	9	**1**	10
B3129	Abbots Leigh to Flax Bourton	2		2
B3130	Pensford to Clevedon	14	**5**	19
B3133	Clevedon to Lower Langford	1		1
B3134	Chew Magna to East Harptree		**1**	1
B4055	Shirehampton to Pilning	5	**1**	6
B4058	Eastville to Charfield	1		1
B4461	Aust to Alveston	1		1
Unspecified	Chew Valley area	9		9
Minor roads	Various locations	44	**15**	59

Table 2. Numbers of road casualty badgers on roads in the former county of Avon in 2004-09.

The most hazardous road was the B3130 (Pensford to Clevedon) with 5 road casualty Badgers reported in 2009 (Table 2). The most dangerous road overall continues to be the A370 (Ashton Gate to East Brent). 31 Badgers have now been run over on this road in the six years 2004-9.

Badgers in the press

'Badger sett traps horse' (*Bristol Evening Post,* December 28). A horse had to be rescued by fire-fighters after it fell into a Badger sett in Lawrence Weston.

'Brutal killing of badger by trio of men' (*Bristol Evening Post*, 31 December 31). Three men with dogs were seen digging a Badger out of its sett near Gold Corner Pumping Station, East Huntspill. The incident was reported to Secret World Wildlife Rescue and the local police by a member of the public.

'Badger Vaccines' (*BBC Wildlife In Brief Vol. 27 (5),* 'Vaccine to tackle badger TB' (*BBC Wildlife News of the Earth Vol 27 (10).* Badgers in six bovine TB hotspots (including a number in the South West of England) are to be given an injectable vaccine from 2010 in a bid to counter the disease.

Otter *Lutra lutra*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	24	2+	25	19+	28+	36+	28+	25+	1+	3+

Records from GB.

Otter signs from Parish Brook (4570), Moorend Spout (4671) and Jacklands Bridge (4771). A road casualty reported from 'Wraxall Manor' in late 2009 and also of a cub found on a road 'between Nailsea and Clevedon' (the cub was taken to Secret World in Somerset).

'Otters eating into fisheries' prized assets' *BBC Wildlife Vol. 27 (8*). The spread of Otters has resulted in an increase in conflicts with fishing and angling interests. Greg Whitehead of Angling Times was quoted as saying 'We are not calling for a cull of otters and we never will, but we do want more research done into their impact on fisheries'. Still-water fisheries can be protected from Otters by fencing and grants are available from the Environment Agency to help towards the costs.

Stoat *Mustela ermina*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	10	4	3	1	0	4	4	2	3	3

Records from KG, DT, DW.

Individuals seen dead on a path at Tickenham Ridge (4472) in May and June, regularly seen hunting at the same location in November, road casualty on the Portway (5674) in June and one seen crossing road at Denny Lane, Chew (5762) in December.

Weasel *Mustela nivalis*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	10	3	7	6	4	7	6	3	4	2

Records from KG, MJT.

Individuals seen hunting along hedge at Tickenham Ridge (4472) on 13 February and running across the road at West End, Nailsea (4569) on 23 June.

European Polecat *Mustela putorius*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	?	2	2	0	0	1	1	2	1	3

Records from JR, GW.

Road casualties from the A46 south of Dodington (7577) on 26 February, Pilning (5484) on 28 October and Pilning (5584) on 15 December.

In England, the 'Avon' area is on the south western edge of the Polecat's range and no doubt the numbers of records of sightings/road casualties will increase over time (Birks 2009). There is some concern as to whether, as Polecats spread across the country, they are pure-bred or crosses with Ferrets and Polecat-Ferrets. The 'Avon' vice-county falls within Zone 2 of the Polecat purity zones i.e. 85-95% of those recorded are true Polecats (Birks 2009).

American Mink *Mustela vison*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	3	0	2	0	1	2	3	3	0	0

No records for the year.

Seals: Order Pinnepedia

Grey Seal *Halichoerus grypus*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	3	5+	0	0	1?	0	0	2	0	0

No records for the year.

Ungulates: Orders Perissodactyla and Artiodactyla

Reeve's Muntjac *Muntiacus reevesi*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares		0	?1	1	3	2	1	2	0	3

Records from GJ, KW.

Two seen at Villice Bay (5560) on 6 September and again on the track to Woodford Lodge (5660) on 5 October. Road casualty found on the A370 at Flax Bourton (5169) on 26 December.

Red Deer *Cervus elaphus*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	1	0	1	0	0	0	0	0	0	0

No records for the year outside deer parks and deer farms.

Fallow Deer *Dama dama*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	0	0	1	1	0	0	0	0	0

No records for the year outside deer parks.

European Roe Deer *Capreolus capreolus*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	51	20+	27	33	26	33	36	35	31	34

Records from RLB, JB, PC, KG, EN, SP, S&JP, DT, DW.

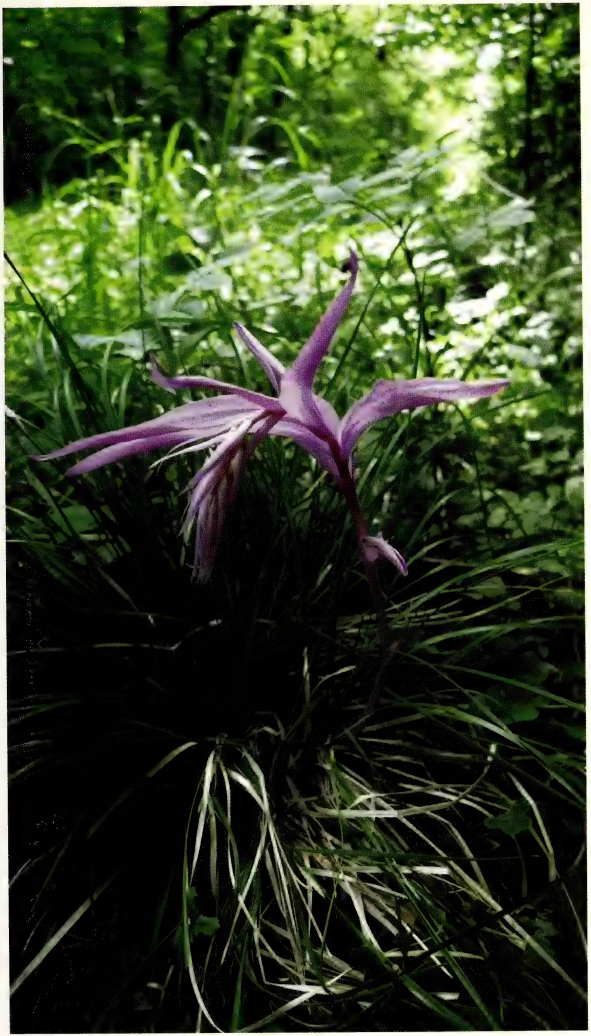
Groups of three or more Roe Deer seen at the following locations:-
Villice Parkland (5559) groups of three and five seen on 3 March, Tickenham Ridge (4472) six seen on 3 April, Wick Green (5759) three seen on 6 April, Ashton Vale (5670) three seen on 6 May, Clapton Moor (4573) three seen on 11 May, Redcliffe Bay (4476) three seen in June, Tyntesfield (5071) three seen on 22 July, Compton Martin (5457) three seen on 9 November.

Dormant Dormouse in Leigh Woods, See Page 28

Crow Lane green space. See page 14

Badocks Wood, The Trym. See page 20

Bee Orchid, Avon Gorge



Violet Helleborine

Leigh Woods January 2010

Ivy, January 2009

Large-flowered Evening Primrose

Fungi rotting roots.

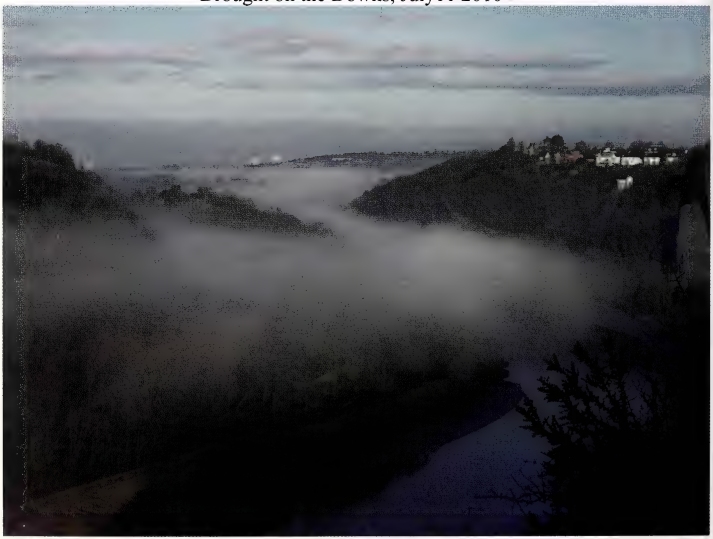
Meadow Saxifrage, Chew Magna

A slimemould, Fuligo septica

Dawn sunlight on a perfect web

Veteran Small-leafed Lime, near Cadbury Camp

Drought on the Downs, July11 2010



Mist in the Gorge January 24 2010

Deer in the press

'Only a nation of animal lovers when it suits us' (letters page *Bristol Evening Post*, 13 May). A deer (*probably a Roe Deer – DT*) was hit by a car outside the entrance to Tyntesfield on the B3128 but the driver failed to stop.

'Giving children space in which to play safely' (*Clevedon Mercury*, 16 July). Roe Deer were amongst the species regularly seen at Gaulacre Fields, off Engine Lane in Nailsea.

Feral Goat *Capra hircus*

'Goats will get to gorge themselves' (*Bristol Evening Post*, 16 April). Goats from the flock at Burrington Combe south of Bristol could soon be roaming freely on the banks of the Avon Gorge. The Avon Gorge & Downs Wildlife Project put forward the proposal as part of a management plan for the Bristol side of the gorge. Goats would be able to keep scrub encroachment in check and enhance the habitat for nearly 30 nationally scarce and rare plant species.

Whales, dolphins and porpoises: Order Cetacea

Harbour Porpoise *Phocoena phocoena*

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 km squares	0	0	0	0	1	0	1	1	0	1

A Harbour Porpoise was found dead in the River Severn at Maisemoor, upstream of Gloucester (*BBC West TV News*, 5 July).

Minke Whale *Balaenoptera acutorostris*

A Minke Whale was washed up on the banks of the River Parrett in Somerset (*BBC West TV News*, 1 September).

CLAPTON MOOR NATURE RESERVE BIRD HIDE RECORDS

People visiting the bird hide at Clapton Moor Nature Reserve (Avon Wildlife Trust) made regular notes of the mammals seen from the hide. Sightings by month are summarised in the table below:-

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mole												
Roe Deer	3	1	4	7	5	3	5	1	6	6	1	1
Fox	2	1	2	4	2	1	2		2	1		
Badger				2					1			
Hare			1	2				1				
Rabbit		1			1+	1	3		3	1		

Table 3. Numbers refer to maximum numbers seen/recorded.

Moles are present throughout the year – their presence indicated by the large numbers of hills in the fields above the hide. Two Roe Deer fawns were seen on 10 July.

EXOTICS/BEASTS/FORMER NATIVE SPECIES

Eurasian Beaver *Castor fiber*

'After 500 years the patter of tiny paws' (*Daily Mail*, 22 August). Photos taken by *BBC Springwatch* consultant Mike Powles have proved that the beavers at the Lower Mill Estate in the Cotswold Water Park have bred. It is thought that the original group of six who were introduced to a 60 acre enclosure from Germany in 2005 have now doubled in number.

Big Cats

Reports of large beast/cats/panthers/leopards/pumas etc roaming the countryside attacking livestock continue to circulate in the press but as yet there have been no confirmed sightings.

There were reported sightings of a lion (described as having large paws, a long tail and a loping walk) at Aztec West, north Bristol (*BBC West TV Evening News*, 21 May). The Avon and Somerset Police helicopter spent 30 minutes hovering over the M4/M5 interchange at Almondsbury but nothing was seen.

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Causes of House Sparrow decline- a summary of Lorna Shaw's thesis.

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Bristol House Sparrows have been exceptionally well studied as a result of studies that include the Winter Garden Survey (1975 to date), detailed studies in the Southmead and Westbury areas by John Tully, the AWT Garden Birdwatch (2000-2010), which was supported by some 3000 individuals, and the Bristol Breeding Bird Survey (2000-date) which has done a standardised study of every 1km square in the city. It has been apparent that the density of Sparrow populations is now highly skewed across the city, with some areas having virtually none, and others, generally socially deprived areas, where they are still very common. In the past decade the evidence suggests that the population has been more of less stable.

Lorna Shaw took this as the basis for her thesis, which was funded by the Natural Environment Research Council and the BTO, and supervised by yhe University of Exeter. She was also influenced by the work of Kate Vincent in Licester. She sought to discover what factors might be responsible for this variation, and whether it was true nationally as well as locally. She also sought to examine the wider implications for urban biodiversity generally. She noted that garden habitats had altered substantially in recent years. In particular paving of front gardens for car parking, consequent reduction in front hedges, the widespread popularisation of patio,. paving, and decking in back gardens, and a general desire to create 'low maintenance' gardens, had all substantially reduced the availability of good foraging habitat for House Sparrows. Bird-feeders were little used by Sparrows, and were no substitute for the damage to the foraging habitat. Lack of vegetation cover inevitably reduced insect populations which were crucial to nesting success. Further more gardens in more deprived areas were more likely to contain native species, which are more likely to be the food plants of a wide variety of insects, than the gardens of less deprived areas. Lack of vegetation cover was likely to increase predation risks. The pressure to build new houses at ever higher densities, reducing total garden space, and often to use urban wasteland, or the former gardens of large houses, for this purpose is increasing the habitat loss for Sparrows.

Using government statistics of deprivation and the BTO Garden Bird watch data she demonstrated that the link between deprivation and Sparrow populations was true nationally, and also that Starling and Sparrow densities were closely correlated, and recently Starling decline has been faster than House Sparrow. Present urban policies are likely to reduce urban biodiversity further, and House Sparrow colony loss was a symptom of a wider problem, and could be used as a measure of biodiversity loss.

House Sparrows now generally live in discrete colonies, and their home range, established by radio-tracking, lies within 100 metres of the nest site, ie one or two gardens in the immediate vicinity of the nest site. There was very little use of public green space, such as parks or sports fields, which generally are too closely mown, and often kept free of native plants. This highly localised lifestyle does suggest that conservation efforts, providing simultaneously nest sites, and good foraging areas with a variety of plant cover, could work. It was notable that many allotments in dense urban areas served exactly this purpose. It is clear that House Sparrow decline has multiple causes, but is closely related to urban intensification and deep-seated changes in garden habitats.

I quote her concluding remarks verbatim; 'The demand for new housing should be viewed as an opportunity to create urban areas that are beneficial for both wildlife and people. In the case of the House Sparrow specifically this could entail incorporating the needs of biodiversity into modern buildings – for example by adding nest boxes and swift bricks to new builds, and by maximising the wildlife potential of the green space available by planting native trees and shrubs and minimising the extent of paved areas; for example by incorporating green roofs into developments. Using the familiar and highly commensal House Sparrow as a starting point for urban habitat monitoring may help to unite landowners, local authorities and planners to secure long term sustainability for not just the Sparrow, but for human populations as well.'

Evenings at the Microscope: G. H. K Thwaites andthe early years of the Bristol Microscopical Society, 1843-1849

Clive Lovatt, Nairobi, Kenya, 7 February 2009, cmlovatt@deloitte.com

In this essay I am using my review in November 2008 of the early minute books of the Bristol Microscopical Society, preserved in the archives of the Bristol Naturalists' Society, and now transferred to the Bristol City Archives, and focuses on the involvement and social circle of G. H. K.Thwaites, a founder member in 1843. Thwaites' farewell letter to the members in 1849 is preserved in the minutes and is transcribed below. The Society was a valued meeting place for the medically trained or scientifically inclined Bristolian gentleman and survived for some 50 years; its history deserves more than the passing attentionand brief notices it has so far received.

Introduction

The Bristol Naturalists' Society, formed in 1862, can in some ways be said to havegrown from the Bristol Microscopical Society, itself founded in 1843, not many years after a similar London society. Our first President and Secretary were members, our initial rules were evidently founded on theirs, and both societies met at the [BristolLiterary and] Philosophical Institution in Park Street. (Now the Masonic Hall).

The records of the Bristol Microscopical Society were held in our own archives and (without having fully researched the matter) I take it that around 1890 their society merged with, or dissolved into, our own. Many of their library books are on ourshelves. There is a huge wealth of manuscript material but nothing printed, save for some copies of the rules. The records cover not only the membership, finances and formal business of the Society, but include many of the unpublished papers read at the evening meetings. These are marked * below where I have noted a substantial manuscript. Some of this is of more than local interest, but my purpose in making aninitial review was to look into Thwaites' involvement with the Society, what he may have left to it on his departure from Bristol in 1849, and to identify and meet otherBristolians from Thwaites' circle.

The founding of the Society

The first meeting of the Society was held in August 1843 at the house of John (J. C.) Swayne. Joseph (J. G.) Swayne exhibited some preparations of animal tissues; in1847 both were lecturers in Midwifery at the Bristol Medical School. Thwaites, an accountant by profession, was elected Secretary and Treasurer and he, William Budd and John Wilson were delegated to draw up the new Society's rules. Other thanThwaites, all of these (and several others mentioned below) were sometime membersof the still extant Bristol Medical Reading Society founded in 1807. Budd

was a pioneer epidemiologist, at various times studying cholera, diphtheria, anthrax, tuberculosis, scarlet fever and typhoid, which he had himself contracted during medicaltraining in Paris. He is described as "Bristol's most famous physician" in a recent biography (2006). A Mr Ormerod was also present.

At the second meeting in mid-September the first members were joined by Augustine Prichard, Dr Symonds, and William Sanders. Prichard was resident at the Red Lodge and at the time a lecturer in anatomy. Later an eye surgeon and a minor contributorto Swete's *Flora Bristoliensis*, he was the uncle and botanical mentor of AugustineLey, co-author of a *Flora of Herefordshire*. Sanders became President of the Bristol Naturalists Society from its foundation in 1862 to 1875; he was the author of the geological map of the Bristol coal-fields which our Society adopted to define its geographical area of interest. Thwaites brought his brother John, a dentist, as a guest and he later became a full member in 1847. (This is the brother incorrectly named as James in part 3 of this biographical sketch, in connection with his interest in cryptography.)

The Society's rules were tabled and approved. The object of the society was "the mutual communication of subjects of interest connected with the microscope and its use". The entrance fee and the annual membership fee were each ten shillings. The meetings were to be on the second Wednesday of the month at 7.30 pm "precisely bythe Exchange Clock" and a member who was late would be fined one shilling. The rules did not apparently exclude women though there never seem to have been any. Miss Martha Maria Atwood, from a wealthy family resident in Clifton was photographedat her microscope in 1856, probably studying her moss collections. Except for her gender she would surely have been a suitable member or guest. (See August 2006 and March 2008 BNS Bulletins for the portrait and further information on her.) Honorary membership was specified as open to *gentlemen* as proposed by the Committee, and was for members of long-standing (10 years) or as it came to be applied, for members who had to move away from Bristol, and therefore could not beexpected to attend meetings regularly or at all.

Initially the Society was named the Bristol Microscopic Society, but in May 1844 the Society's name was changed to the Bristol Microscopical Society. It was planned to rotate meetings at members' houses, where the member would supply microscopes, lamps, and the evening lecture. In December 1843, the meeting place was fixed at theCommittee Room at the Philosophical Institution. The Bristol Medical Reading Society was limited to 12 members, also met monthly at members' houses (and perhaps at theInstitution too) and had a similar system of fines; but despite the significant overlap inmembership, the Bristol Microscopical Society's evenings at the microscope were not at all dominated by medical exhibits and lectures. By the end of the first year, there were 18 paid-up members; the income paid for cash and minute books, lamps and oil, microscope slides and boxes, meeting circulars and postage, and the printing of the rules.

Thwaites' circle: the early meetings and membership

At the November 1843 meeting Dr William B. Carpenter, whom Thwaites had assisted in revising one of his physiology books, read "an interesting paper" and exhibited slides showing the variety of organisation apparent in molluscan shells. In May 1844 he was made an honorary member on his departure for a professorship in London. Carpenter later (1856) published a book entitled *The Microscope and its Revelations* and he and Thwaites appear in Darwin's memorandum of March 1860 listing his 15 earliest supporters immediately after the publication of the *Origin*.

In December 1843, Thwaites showed how polarised light could be used in examining plant tissues under the microscope and in July 1844 he exhibited marine and freshwater algae and talked about their structure and reproduction. In May 1845 he spoke on reproduction in mosses, something not well understood at the time, and likened the capsule with its stalk (seta) to the single seed of a flowering plant. Both structures are indeed formed from the fusion of haploid male and female gametes. In April 1846 he spoke on the cell membrane of plants* and in June 1847 he presented his paper on conjugation (a form of sexual reproduction) in diatoms. This was illustrated with drawings and microscope slides.

Samuel Stutchbury was the curator of the museum at the Philosophical Institution. In March 1844 he exhibited sections of teeth of fossil fish and reptiles (dinosaurs) lent to him by Professor Owen of London, drawings of which Owen had published in book form. This is particularly interesting in the context of Stutchbury having made the original identification of fossil reptile teeth, and then in 1834 finding more examples in quarries on the Downs at Bristol. A later curator, Robert Etheridge, also at least attended some meetings of the Society from 1849; he later rose to prominence as a palaeontologist and became President of the Geological Society of London (1881-2). Sanders spoke on the structure of coal in 1847.

In March 1844, Thwaites proposed his friend Henry Oxley Stephens as a member and in November that year Stephens spoke on the reproductive bodies of fungi, illustrated by diagrams, coloured drawings and slides of spores. In April 1849, Stephens lectured on fungi as parasites on plants and animals. Potato blight was at this time beginning to be understood. Thwaites later did good work in Ceylon on coffee blight. Stephens became a vice-president of the society in October 1849.

In February 1844, Dr George Rogers was admitted as a member and in January 1845 gave a paper on his observations of lichens. He is mentioned in Stephens' catalogue of Bristol plants in 1835 and was probably instrumental in developing Stephens' interests in field botany. He had a herbarium, probably one of the sets of volumes lost in the bombing of the Bristol Museum in 1940, but there are some Bristol specimens of his in H. C. Watson's topographical herbarium at Kew, and in

the Natural History Museum in London. David Allen and I now agree he was the Botanical Society of London (BSL) member shown incorrectly as resident in London in Allen's reconstructed membership list (*The Botanists*, 1986).

Frederick Russell's plant records from Bristol and beyond go back to the 1820's and are scattered in the pages of the last edition of Withering's *Botanical Arrangement* (1830). He joined the Bristol Microscopical Society in March 1845 and in January 1846 gave a lecture on the stomata of leaves. In 1844 he had married Anna Worsley, a fellow Unitarian, with whom he had been botanising for some years. She was a BSL member in her own right; quite unusually for the time, they admitted women. Both she and Thwaites began as entomologists and on taking up botany provided H. C. Watson with a Bristol list of plants. As she is known to have presented some mosses to the BSL in 1841 and later took to drawing fungi (700 drawings in the Natural History Museum), she may be assumed to have been a microscope user herself.

Though their marriage was childless, a nephew, Thomas Hawkes Russell, later published a book on mosses and liverworts, and a niece, Alice Worsley, provided Watson with a plant list for mid-Perth in 1872. In May 1845, Christopher E. Broome was proposed as a member by Thwaites and Stephens and in March 1846, he spoke on the underground fungi* such as truffles. He was at the time just embarking on a long running series of published papers on the subject with the Reverend M. J. Berkeley. In October 1848, as he was on the point of leaving Bristol, he was made an honorary member. In September 1846, Thwaites announced that he was intending to put himself forward as a candidate for a botanical Chair in one of the new Irish colleges. The minutes record that he asked the Society for "a testimonial expressive of the opinion as to his qualifications for fulfilling the duties of such a position". The Society agreed and delegated their President (one of the Swaynes?), Budd, Neild and Stephens to draw it up. As previously noted, they commended his "sense of duty enthusiastic love for the science".

I had taken the Dr. Bernard who seems to have acquired Thwaites' main herbarium when he left for Ceylon to be the Ralph M. Bernard who appears on Thwaites' testimonial of January 1847. He became a member in January 1845. However, Dr. James F. Bernard was elected a member in November 1848 and it is he who is regularly referred to as Dr. Bernard. He resigned in 1857, having to leave Bristol due to ill-health.

John Duck, later author of a short *Natural History of Portishead* (1852) was a member from January 1845 and in December that year spoke (fittingly, perhaps) on the anatomy and physiology of feathers. In February 1848 he spoke on the respiration of insects*. In November 1848 there was a lecture on butterfly and moth wing-scales. Lectures of medical interest included the anatomy of the spinal cord* (Budd in July1846), and the eye (Prichard in February 1847). In January 1847 William Herepath contributed a paper on microscopic chemistry. This was less than two weeks after he (having made the substance) had initially administered the ether used in the earliest operation under anaesthetic in Bristol, during the amputation of the greater part of a patient's left leg. Anaesthesia had first been used in Boston in October 1846. Another botanical evening was held in May 1847, when the members were shown the intracellular circulation in the remarkable giant internodal cells of the green alga, *Chara* (stoneworts).

Samuel Rootsey had published a list of Bristol plants in 1820 in Evans' *Beauties of Clifton* and it was reprinted at intervals (e.g. 1828). He published a few articles on the local names of Bristol plants in the Transactions of the Medico-Botanical Society of London in the early 1830's. In June 1849, Herepath and John Swayne moved "that Mr S. Rootsey be informed that the Society would be glad to see him as a visitor at any of their monthly meetings" suggesting he was regarded as an important figure and perhaps lacked the time or funds to participate fully. He attended at least two meetings in 1849 and one in April 1854.

The farewell letter of G. H. K. Thwaites and the souvenir left to the Society.
After giving notice at the meeting of 11 July 1849, Thwaites' letter of resignation as Hon. Secretary and Treasurer was read out on 8 August. Stephens moved that Thwaites be made an honorary member and this was unanimously approved. It was also minuted that the letter be retained, and there I found it, sewn into the minute book. It is the letter I had fondly imagined (having been through much the same experience in 1988) when I wrote in September 2008, "But before leaving Bristol Thwaites had to deal with family matters, arrange his passage, dispose of his botanical collections and buy new books, *and say his farewells*".
To the members of the Bristol Microscopical Society
My dear Friends
In retiring from the office of Hon Secretary and Treasurer to your Society I must express how much I am affected by the near prospect of a separation from you, both as members of a society which from its commencement has possessed my warmest interest and as personal friends from whom I entertain much sincere regard, & who have always shewn such a feeling to be reciprocated on their parts towards myself. I need scarcely say how gratified I shall ever be to hear of the good progressof the Society in useful investigation, & should opportunities be afforded to me, an occasional contribution of some little matters connected with

the objects which will claim more particularly my attention in the new position I shall shortly occupy may be expected from

Yours very faithfully & sincerely
G. H. K. Thwaites
London 7 August 1849

At the November meeting, by which time Thwaites was at sea, John Thwaites made a "handsome present" to the Society. This was the lamp his elder brother had used in his microscopy, described as "a lamp with a flexible tube to affix to the gas pipe". Understandably, this was not something which could be used in Ceylon. That this was the only gift suggests that his microscope travelled with him (he later remarked how rarely he used it) and that the microscope slides of algae had either been sold, as he intended, or left with his brother.

Conclusion

Thwaites was commended in the first annual report of the Bristol Microscopical Society for "the kind, the judicious, the efficient services of so valuable a Secretary and so scientific a member as Mr G. Thwaites". Thwaites contributed much to the establishment and future survival of this small society of medically trained or scientifically inclined Bristolian gentlemen. Hewould apply the same characteristics in his new life at the botanic gardens in Ceylon, "a position very congenial to me in many respects", as he summed it up on approaching retirement in 1878.

The title of this piece, *Evenings at the Microscope*, comes from Philip Henry Gosse's popular natural history book published, like Darwin's *Origin*, in 1859. Information on the Bristol Medical Reading Society and its members is mainly from John Powell (a current member) and his website www.johnpowell.net, where photographs and further biographical information of several of those mentioned here may be found.

A study of four ponds at Folly Farm as breeding sites for amphibians

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Editors note.
This article is a much reduced summary of a dissertation produced as part of certificate in Wildlife Biology at Bristol University. The original is copiously illustrated with graphs, tables and photos, and it is regretted that there is not space for them here. The New Pond described below was built as the result of a donation by the Bristol Naturalists Society to the Avon Wildlife Trust Folly Farm appeal.

1.Introduction

Avon Wildlife Trust's Folly Farm Centre underwent major renovation and construction work during the period 2005–2008. This survey aimed to establish whether, despite disruption to the surrounding environment, the cluster of four ponds around the buildings still represents a suitable breeding area for amphibians, notably, the common frog (*Rana temporaria*) and common toad (*Bufo bufo*), and three newts, the smooth newt (*Lissotriton vulgaris*), palmate newt (*Lissotriton helveticus*) and great crested newt (*Triturus cristatus*).
All five species have been known to breed on the site in the past, but no formal surveys have been undertaken except to assess the site as a great crested newt habitat (Wood, 2005) when the Kitchen Garden Pond, Long Pond and Orchard Pond, together with two of the dew ponds on the Reserve were examined.
The four ponds included within this study - the Kitchen Garden Pond, the Long Pond, the Orchard Pond and the New Pond - are within 50m of the buildings where there is a high level of anthropogenic activity.
Nationally, although still a common landscape feature, the number of ponds, particularly in an agricultural/rural setting has declined dramatically over the past century. Those that remain are often under increasing pressure from agricultural land drainage, pollution, urban/property development. As many species are dependent not only on the aquatic environment, but also the ponds' catchment areas during their terrestrial phase, the network of habitats found between ponds needs to be examined. This is particularly the case for amphibians as it influences foraging activity and the location and availability of hibernation sites. For that reason, even though the pond itself maybe untouched by construction work, anthropological activity even some distance away from the individual ponds or pond clusters, may have a significant effect on dispersal and colonisation of new ponds.
Carrier and Beebee (2003) state that in Britain at least four amphibian species (*Rana temporaria, Bufo bufo, Bufo calamita and Triturus cristatus*) experienced a dramatic decline in numbers during the middle part of the 20th century. During the 1980s and 1990s common toad numbers declined further, particularly in south east

England, although populations in the north and west were generally stable. Common frog populations, however, have proved more robust and fared well especially in garden ponds. These declines were largely due to changes in land use.

Pavignano *et al* (1990) demonstrated how influential a range of parameters, including habitat characteristics, pond age, human interference and macrophyte presence, are on the suitability of ponds for amphibians. Their research indicated that the smooth newt and great crested newt occurred sympatrically and tended to have specific ecological requirements, notably ponds with luxuriant vegetation which provided good oviposition sites, shelter from predators and food. The common toad colonised more heterogeneous habitats. De Fonseca and Jocqué's (1982) study of palmate newt distribution indicated that their habitat requirements may not coincide much with other amphibians, their preferences being primarily for permanent, shaded sites, with secondary preferences being for clear, medium to large water bodies.

Later, with particular reference to great crested newts, Oldham *et al* (2000) added the importance of food availability to the suitability of the location. This is clearly vital to newt survival and, all other factors being equal, the more food there is the more newts can be supported. Aquatic invertebrate diversity and abundance will have more of an impact on newt numbers as these species tend to stay to feed in the pond for longer periods than frogs, whose aquatic phase is more restricted to spawning times. As it is not easy to assess and measure food sources, Oldham *et al* (2000) suggest that the diversity and density of vegetation, as it provides either a direct or indirect food source for prey organisms, is a more readily measurable indicator of food availability.

In order to assess the suitability of the four ponds as breeding sites for amphibians, the key points for investigation were: water quality; the availability and abundance of food (aquatic); vegetation for newt egg-laying ; open water for anuran spawning and newt displaying; surrounding habitat suitability for terrestrial phase and accessible hibernacula.

It is important to note that individuals, particularly long-lived species such as great crested newts and common toads, may persist at a site long after it has ceased to be suitable for breeding.

2.Materials and methods.

The four ponds selected are within 50m of the Folly Farm Centre buildings. Recently excavated and restored dew ponds around the reserve were not included in this study because of their distance (>300m) from the Centre, pastoral location and because of scheduled, but incomplete, restoration work.

Water temperature, water surface area and basic chemical water quality readings were recorded during the period November 2009 to June 2010. Surrounding, marginal and aquatic vegetation was recorded and potential hibernacula noted. Invertebrate presence and absence was noted. Netting, torchlight counts and bottle trapping surveys were carried out for newt species and visual inspection (both daylight and torchlight) for frog and toad species.

2.1 Survey of key variants in the physical environment

Water temperature readings were taken at between 10am and 12 noon once a week from 22nd January until 3rd May 2010 with a 10cm temperature probe (temp. range -50° C – 150° C) at a depth of up to 10cm at the same position at the edge of each pond, regardless of shade or sunshine. The sequence was randomised so that different ponds were tested first each week. The water surface area and depth of each pond were estimated in November 2009, March 2010 and again in June 2010.

Water quality was tested in January, March (all four ponds) and June (New and Orchard only) with NT Labs Pond Health Check multi-test for pH, nitrite (NO_2-N) and ammonia (NH_3) levels. As pH will be affected by carbon dioxide, it will be lowest at dawn and highest in the afternoon due to the effect of plant and algal growth. All water quality tests were taken between 11am and 3pm.

Both marginal and surrounding vegetation (up to 2m from edge of pond) was recorded over the period November 2009–June 2010. The orientation of each pond was calculated and an approximation made of amount of shade caused by surrounding trees.

2.2 Sampling methods used to investigate amphibian and invertebrate presence

Griffiths *et al* (1996) made an evaluation of the effectiveness of the various methods of detecting newt species and concluded that the type of site was the biggest variable. In larger, more turbid ponds trapping was the most effective, but torchlight counts were better for detecting great crested newts in smaller, more accessible ponds. Dip netting was the least effective. In this study, all three methods were used, but bottle traps were set only in the New Pond because of a) accessibility and b) the possibility of water shrews being present in other ponds.

2.2.1 Dip netting

A 1mm knitted polyester mesh net (conforming with Environment Agency specifications) measuring 35cm x 18cm was used. Catches were put into sample trays (50cm x 35cm) with approx 3cm pond water in the bottom.

A pilot dipping session took place in November 2009 as an initial survey. Regular dipping started in February 2010 and samples were taken once a week through February and March. Size of pond and tall aquatic vegetation in some ponds prevented consistent adherence to 2m net sweeps.

In order to be as consistent as conditions allowed across all four ponds, 0.5m sweeps were possible in most cases.

2.2.2 Torchlight surveys
Torchlight surveys took place once a week from 31st March until 10th May.

2.2.3 Egg Search
Griffiths and Raper's (1994) review of techniques for sampling amphibian communities cites spawn counts as the best and most practical method of detecting frog presence as this also gives a relatively accurate assessment of abundance. Frog spawn was recorded by numbers of clumps and toad spawn by numbers of strings. Newt egg searches were carried out on two occasions in each pond except the Kitchen Garden Pond where one search took place when water levels allowed and before encroaching vegetation prohibited further surveys. All accessible marginal vegetation was checked for folds (newt egg presence) and species noted where possible (by size of fold/egg).

2.2.4 Bottle Trapping
Three bottle trapping sessions took place in the New Pond: two in May and one in June. Bottle traps were made from plastic two-litre soft drink bottles, perforated at the bottom to allow air transfer and held in place by a bamboo cane (Froglife, 2003). Ten traps were used in the first trapping session, 12 (one every 2m where possible) in the second and 15 were used for the third trapping session. Bottle traps were set during the hour before dark and checked by 7am the following morning. Newts were not handled before release unless this was necessary to check for sex, species or breeding condition.

3.Results
Five species of amphibian (the common frog, common toad, smooth newt, palmate newt and great crested newt) were recorded on the site. Whilst at least one amphibian species was found in every pond, evidence of breeding was recorded in only three ponds: the Long Pond, the Orchard Pond and the New Pond.

3.1 The physical environment
All four ponds were frozen for most of January and again at the beginning of February. Frogs and toads did not spawn until water temperature had risen to >8˚C. Newt species were recorded for the first time in the New, Kitchen and Orchard ponds at the same temperature level. Smooth newts were recorded in the Long Pond in January when the water temperature was 3.5˚C.

Over the winter period November 2009 – February 2010 the water in all four ponds reached expected or above expected levels. By the beginning of March a quick visual assessment suggested that water levels were beginning to drop.

By the end of May many marginal plants used for newt oviposition were fully exposed. By the end of June the Kitchen Garden Pond, Long Pond and Orchard ponds were dry.
Water quality tests showed no Ammonia (NH_4) and no Nitrite (NO_2-N) present. pH levels were all within the range of 6.0 – 8.0 (Table 1).

3.2Invertebrate and amphibian presence

3.2.1Dip netting

Dip netting did not provide any data on the presence of amphibians other than the presence of newt larvae later on in the season, mainly in the New Pond. It did, however, produce useful evidence of aquatic invertebrate presence or absence.

The greatest diversity of aquatic invertebrates was found in the New Pond and the least in the Kitchen Garden Pond. Netting ceased during April and May to avoid disturbing egg-laying newts and laid eggs. Some species were clearly visible without netting, but numbers difficult to assess. The freshwater hog louse (*Asellus aquaticus*) and *Daphnia spp* were the only invertebrate species found in all four ponds although their abundance differed dramatically. The Long Pond and the Orchard Pond both had high levels of *Daphnia spp* during the spring months and were the two ponds where the common frog spawned. Dragonfly (*Anisoptera spp*) nymph and damselfly (*Zygoptera spp*) nymphs were found only in the New Pond.

3.2.2Torchlight surveys

Weekly torchlight surveys throughout April and May proved to be the most effective method of detecting newt species.

Peak newt activity occurred during the middle two weeks of April, with the smooth newt present in the highest numbers. Smooth newts and palmate newts were the most abundant species and occurred in all four ponds. Numbers of male palmate and great crested newts recorded were higher than numbers of females across all ponds where present. Numbers of female smooth newts recorded at any one time were higher than males. Visibility in the New Pond was good and on four occasions it was possible to identify juvenile great crested newts. Access to the Long Pond was not adequate and visibility not good enough to identify juvenile great crested newts with any certainty. Equally, differentiating between female palmate newts and female smooth newts was not possible by torchlight, so assumptions were made based on the identification of the male: ie if the males were displaying or close by, it was assumed that they were with females of the same species. Males of all three newt species were seen displaying in the New Pond and Long Pond.

Although common frog and toad individuals were occasionally seen at night, most were seen during daytime searches at spawning time.

3.2.3Egg searches

Newt oviposition was recorded in the Long Pond, Orchard Pond and New Pond. Because of their size and the size of leaf fold, it could be confirmed that great crested newts laid in the New Pond. The preferred vegetation for oviposition was water forget-me-not in the New Pond, water mint and decaying lesser pond sedge in the Orchard Pond, and decaying reed canary grass in the Long Pond.
A small amount of toad spawn was recorded in the New Pond. Frog spawn was recorded in the Long Pond and Orchard Pond

3.2.4Bottle trapping

Bottle trapping during the period of peak newt activity (mid-April) was not possible because of cold night time temperatures. Newt activity decreases in cooler temperatures and trapping is not recommended below 5˚C (Froglife, 2003). On the first trapping night the air temperature was recorded as 7.1˚C but may have dropped soon after the traps were set and this is the most likely cause of a nil return. All newts trapped were in breeding condition with the exception of one juvenile great crested newt.

As three female great crested newts were caught in one trap and two in another on the second trapping night, it was decided to set more traps on the third night in an attempt to prevent overcrowding.

3.2.5 Surrounding vegetation and habitat

The Kitchen Garden Pond, Long Pond and Orchard Pond all experience a period of diurnal shade due to tree cover. Trees in close proximity to the Long and Orchard Ponds are mature specimens. The New Pond is very exposed and experiences no periods of diurnal shade. The Kitchen Garden Pond, Long Pond and Orchard Pond all feature mature specimens of both marginal and aquatic vegetation, but no oxygenating species were recorded. The Kitchen Garden Pond is dominated by marsh marigold (*Caltha palustris*); the Long Pond margins are dominated by lesser pond sedge and the pond basin by reed canary grass, and the Orchard Pond by Bogbean (*Menyanthes trifoliata*). The New Pond was planted with a wide range of marginal and aquatic species in 2008–2009 and has the greatest marginal and aquatic diversity, including Cotton Grass (*Eriophorum angustifolium*), Marsh Marigold, Water Forget-me-not (*Myosotis scorpioides*), Water Mint (*Mentha aquatica*) and Yellow Flag (*Iris pseudocorus*). The Kitchen Garden Pond is the only pond without water forget-me-not and water mint, and the only pond where no great crested newts were recorded.

The Kitchen Garden Pond is set within the kitchen garden, with vegetable beds, a polytunnel and a compost heap close by. The majority of this garden area is not currently being cultivated. Beyond the garden boundaries are pasture (south and east) and buildings, gravel aggregate and lawn (north and west). The southern edge of the Long Pond is bordered by mature willow (*Salix capraea* and *Salix alba*), hazel (*Corylus avellana*) and ash (*Fraxinus excelsior*) on a small but steep bank. Small mammal holes can be seen across the bank. Beyond the bank lies a small paddock enclosed on three sides by dry stone wall, otherwise the pond is surrounded by buildings and gravel aggregate. The Orchard pond is in the corner of a small orchard area with mature apple trees (east) and a variety of small deciduous species closer by. Renovated dry stone walls are within 2m to the north and west. The New Pond is surrounded by <1.5m gravel aggregate. Beyond the aggregate is lawn (south), pasture (north and west) and garden (east). An overflow pipe prevents water levels rising to the same level as the stone-edged pond perimeter

All four ponds are less than 50m from grazed pasture and deciduous woodland. A stream (flow controlled by Bristol Water) runs in a steep banked gully through the woodland.

4.Discussion

All five of the amphibian species examined in this study have high fecundities, with each female laying several hundred, or thousand, eggs. All five species did breed, but not in all four ponds. The two key factors to hinder breeding success were pond desiccation and predation.

An unusually hot, dry summer prevented long term newt larval survival (ie until metamorphosis) in the Kitchen, Long and Orchard ponds. Larval survival is dependent upon food supply, competition, predation, temperature and the risk of pond desiccation. At the beginning of this study the desiccation of three out of four of the ponds did not seem likely, but as the summer progressed, it became apparent that desiccation would be the single most influential factor impacting on breeding success in 2010. Amphibian fitness in later life is directly related to size at metamorphosis (Griffiths, 1997), so for the long term survival of these populations maximising a) survival to metamorphosis and b) size at metamorphosis is the greatest challenge.

Whilst the five amphibian species in question may often have overlapping requirements for breeding, for the purposes of this discussion each species will be examined individually.

4.1Common toad

The Folly Farm site has not historically been known as an abundant common toad breeding site, but individuals have certainly been seen, notably around the Kitchen Garden (Smith, J. 2010. pers. comm.). During this study period (January–June 2010), the common toad was recorded only in the New Pond and the small amount of spawn laid suggests that only one pair bred there this year. By the end of April 2010 no toad tadpoles were visible and subsequent dip netting supports the supposition that none survived beyond that date.

Toads and their tadpoles are unpalatable to most vertebrate predators because of the toxicity of their skin, but this does not deter grass snakes. These have not been recorded on site since 2001, but this is when the last formal survey was carried out and more recent data is not available. Toad tadpoles are also an important food source for aquatic invertebrates such as dragonfly and water beetle larvae (Inns, 2009). The New Pond was the only pond where dragonfly nymphs were recorded and recent (June/July 2010) hatchings indicate a large population. Dragonfly nymphs and *Dytiscus* larvae and adults may not necessarily ingest whole tadpoles, but selective predation to the cranium and abdomen can cause lethal damage (Ballengée & Sessions, 2009). Beebee (1981) suggests that larger, older pools with fish may be optimal for the common toad as the fish offer some protection against predatory species.

Predation was the most obvious cause of tadpole development failure, but the reasons for such a small adult community remain unclear. The New Pond exhibited the greatest invertebrate diversity and is surrounded by pasture, some scrub and garden, so a good range of both aquatic and terrestrial food sources are available. Together, the close proximity of open deciduous woodland, small areas of scrub, the garden and pasture are likely to provide a range of ideal over-wintering sites where disused rodent burrows can be found (Inns, 2009).

Carrier & Beebee (2003) found no explanation for the dramatic decline in toad numbers experienced since the 1980s, but suggest that toads breeding alone have fared significantly worse than those breeding at sites where frogs were also present. At Folly Farm common frogs have been shown to breed in both the Orchard and Long pond, but did not breed in the New Pond where toads occurred.

Scribner *et al* (2001) found that toad abundance is positively correlated with the proportion of surrounding 'rough' pasture. Whilst there is pasture close to the New Pond, it could not be described as 'rough' as it is closely grazed by sheep. According to Griffiths (1997) toads prefer water bodies that are not prone to desiccation and the New Pond was the only pond on site not to dry before the end of the study period (June 2010).

Toads migrating to a breeding pond are very sensitive to temperature and periods of cold and frosty weather (below 4°C) can halt migration (Gittins *et al*, 1980). It is possible that the continuing cold snaps in early 2010 prevented a larger population reaching the ponds. Verrell's (1987) study showed that common toads have preferred migration routes and it is possible that the Folly Farm population's path was disturbed during the two year construction period when heavy vehicles were constantly using the site.

Common toads have a long life span, occasionally decades, (Gittins *et al*, 1980) so the possibility of a more successful breeding season in the future remains, but it is unlikely that such a small population is viable in the long term. Continued breeding on the Folly Farm site within the current population is likely to lead to a reduction in tadpole fitness due to inbreeding (Carrier and Beebee, 2003). There are several other ponds within the 2km radius suggested by Scribner *et al* (2001) as the maximum distance travelled by common toads, but no information on whether these sites are current toad breeding ponds is available. Roads and sheep pastures may both hinder dispersal; the former because of traffic and the latter because a more open landscape increases the risk of predation.

Swan and Oldham (1993) point out that the common toad will readily occupy a new pond. If the New Pond provides a better habitat than the older, smaller ponds because of its closer resemblance to the lakes and gravel pits favoured for breeding (Inns, 2009) there may be potential for it to become home to a growing population. In order to establish local toad abundance and meta-populations, a more detailed survey of ponds outside the Folly Farm site would be necessary.

4.2Common frog

I have personal knowledge of the Folly Farm site since 2001 and have known the Long Pond and Orchard Pond to be annual common frog spawning sites since that time. Justin Smith (pers. comm.) recorded frogs breeding in the Kitchen Garden Pond in April 2003, March 2004 and March 2005. However, in the past the Long Pond has been the dominant site.

Common frogs will always spawn in the shallowest, sunniest part of a pond (Inns, 2009). Like frog spawn, the alien invasive New Zealand pigmy weed (*Crassula helmsii*) requires high light levels for optimal growth and becomes sparse in areas shaded by overhanging trees and bushes (Dawson & Warman, 1987). Clearance of the *Crassula helmsii* from Orchard Pond in 2006/2007 created a shallow, sunny area and this may be one of the main reasons for the abundance of spawn there this year. Spawn covered more than half of the Orchard Pond and was all in the south/south eastern part.

The southern part of the Long Pond is in shade for the larger part of the day because of a row of trees lining the south bank. It has been shown that there is a strong relationship between air and water temperatures and amphibian life-cycle events such as emergence from hibernation and the initiation of breeding (Carroll *et al*, 2009). The winter of 2009/2010 saw the most widespread and prolonged cold period, which extended from mid December through to mid January, since 1981/1982 (Met Office, 2010). The Folly Farm ponds remained frozen until mid January and then froze again in February. Temperatures remained low throughout February and early March. First spawning dates for the Bristol area in 2010 were on average 10 days later than 2009. (Bland, R. pers. comm.).

The Long Pond was on average 0.47˚ C cooler than the Orchard Pond. Most water temperature readings were taken during the morning, but on 1/3/2010 all readings were taken during the afternoon. No record of amount of sunlight was taken for this study, but the data suggests that the water in the Long Pond does not heat up during the day as much as in the other ponds because on this date the Long Pond was 2.2˚ C cooler

The spawn that was laid in the Long Pond was on the more open, less shaded north side but much was clearly predated before hatching. Small newts (common or palmate females) were seen in large numbers on and around the spawn and are voracious predators of both spawn and tadpoles (Inns, 2009). Although spawn was laid only a day or two later in the Long Pond, hatching took place in the Long Pond approximately one week after the spawn in the Orchard Pond.

By 19/4/2010 no tadpoles were visible in the Long Pond and because of their habit of clustering in a shallow sunny patch, it was expected that their presence would have been noted. By 8/6/2010 water levels in both spawning ponds had dropped dramatically, the tadpoles in the Orchard Pond had become increasingly crowded and there was no visible evidence of metamorphosis. Under such conditions the increase in intraspecific competition may have the beneficial impact of causing larger tadpoles to inhibit the growth of smaller tadpoles so that if the pond is drying up only the largest tadpoles are likely to complete their development on time (Griffiths, 1997). Clearly this has a more positive impact on the long term population than 100% mortality due to early pond desiccation. An inspection of the Orchard Pond at the end of June confirmed that the site was devoid of water but one froglet was noted.

No spawn was recorded in the Kitchen Garden Pond this year. Encroaching *Crassula helmsii* and marsh marigold left little space. Furthermore, even though the water temperatures recorded on 24/3/2010 (nearest recording to spawning time) were all very similar (8.8˚C Kitchen, 8.6˚C Long, 9˚C Orchard and 9.4˚C New) the average water temperature in the Kitchen Garden pond over the period February – May was 0.38˚ lower than the Long Pond and 0.83˚ cooler than the Orchard Pond.

Given the proximity of the New Pond to their birth sites, it is perhaps surprising that common frogs did not breed in the New Pond which proved to be the warmest and sunniest. However, lack of marginal vegetation and steep, hard edges would make egress from the pond particularly difficult for froglets. In 2009 considerable effort was made by Centre staff to build up the internal edges with small stones to improve accessibility, but a combination of freezing temperatures and frequent pond dipping activities may have caused many of the stones to fall away and dropping water levels through the spring rendered any remaining elements of this work ineffectual. Because of the gravel path surrounding the pond, any froglets that did succeed in leaving the pond would be exposed to predation, for example from birds.

4.3Smooth and Palmate newts

Smooth newts were found in all four ponds, but were most abundant in the Long Pond and Orchard Pond. Because of the difficulty in differentiating between female smooth newts and female palmate newts by torchlight, and between smooth newt and palmate newt eggs and larval forms, the data collected could be unreliable. However, it was noted during torchlight surveys that the eastern end of the Long Pond was more popular with male palmate newts than other species, so eggs found in this area were assumed to be palmate. Data collected shows that over the breeding period more female smooth newts were recorded than males, but this may suggest an element of researcher bias or mistaken identification. Small females were recorded as smooth or palmate depending on their activity and position: when male newts were recorded displaying, it was assumed that they would be active near, or courting, females of the same species. Equally, the part of the Long Pond preferred by palmate males, was assumed to be preferred by palmate females, rather than smooth newt females. On the basis of the numbers found, it would appear that both smooth newts and palmate newts have sustainable populations across the ponds, with 45 and 28 individuals respectively recorded on one night, although it is not clear what percentage of the population these figures represent.

The smooth newt is considered the most adaptable species: it colonises readily from garden ponds in urban areas to any clean, sunny pond on neutral or slightly alkaline soil in rural habitats. In contrast, palmate newts tend to prefer ponds with a neutral to slightly acidic pH (Inns, 2009). As the pH levels in all the ponds at Folly Farm were near neutral, this proved not to be an issue for either species. De Fonseca and Jocqué's (1982) findings that palmate newts prefer permanent, shaded ponds is also not borne out in this study: the New Pond is not shaded and all of the other ponds have experienced desiccation at some stage over the past ten years.

As stated by Oldham *et al* (2000), food availability is crucial to successful breeding. The Long Pond experienced a bloom of *daphnia sp* during the early spring period and this is a primary food source for all three newt species (Griffiths and Mylotte, 1987). It is interesting to note that smooth newts were identified as being present in the Long Pond when the temperature was only 3.5˚C; further investigations might be able to clarify if this was because such an abundant food source was available. *Daphnia sp* are known to exploit temporary ponds because they can switch to asexual reproduction to produce drought resistant eggs. Fewer aquatic invertebrate predators inhabit temporary ponds, so a bloom occurs when the eggs do hatch and before vertebrate predators can have an impact on numbers (House, A. 2010. pers. comm.). Some newt individuals stay a long time in a pond during the breeding season and will gain body mass. Those that stay a shorter time can lose mass. Building up a greater body mass during the aquatic phase will enhance winter survival, but may also impact on reproductive effort (Verrell and Halliday, 1985).

Smooth newt and palmate newt eggs are small and usually concealed in dense submerged vegetation (Griffiths and Raper, 1994) so it is possible that the eggs found amongst the marginal vegetation in the New Pond, decaying reed canary grass in the Long Pond and both marginal and aquatic vegetation in the Orchard Pond may belong to other species, but dropping water levels may have revealed previously submerged material. Leaf folds were not opened to examine egg species, but size of fold was used as a method of estimating which species had laid there. Small numbers of common and palmate newts were recorded in the Kitchen Garden pond, but no evidence of oviposition was found. Neither water mint nor water forget-me-not were recorded in the Kitchen Garden Pond and marsh marigold, the dominant vegetation, does not have suitable flexible leaves for folding.

4.4Great crested newts

Because they are a protected species and their abundance on the Folly Farm site was unknown, the suitability of the ponds and surrounding habitats for great crested newts has been of particular interest. Even before the Habitat Suitability Index score was calculated for each pond in May, it had become apparent that the great crested newt population was significantly higher than anticipated. During 2009, the New, Orchard and Kitchen ponds retained some water until September, giving newt larvae time to complete their development. Juvenile great crested newts are the ones to colonise new ponds, and if they stay beyond that first year, they will continue to be faithful to that pond (Dickson, J. pers. comm.). Juvenile great crested newts go to the pond in spring to feed and can be up to 18 per cent heavier when leaving than when entering the water (Verrell, 1985). The presence of juveniles returning to the New Pond this year to feed suggests that last year (2009) was a successful breeding year. Data from the NARRS Update showing that in 2009 a higher percentage of ponds were occupied by amphibian species (common frog, common toad, smooth newt, palmate newt and great crested newt), than in 2008 and 2007, would support this supposition. The fact that juveniles prefer to remain close to the pond of their birth through their first winter may have improved their survival rates as the ponds themselves were untouched through the 3 year development period. Individuals in the adult population, however, may either stay in one pond, or come and go during the breeding season if a different pond is better for feeding (Swan and Oldham, 1993).

Smooth, palmate and great crested newt eggs take around two weeks to hatch, but do not complete their metamorphosis until late summer (Inns, 2009). Rapid desiccation prevented larvae in the Orchard and Long ponds from reaching maturity. Even the early laid eggs would not be ready to start their terrestrial life by mid-June. Eggs laid in the New Pond, however, fared better, even though dropping water levels meant that much of the water forget-me-not used for oviposition became exposed before hatching. Recent pond dipping sessions with school children confirmed that many eggs did hatch, as numbers of larvae found were high. As many of the mature dragonfly nymphs foraging in the pond hatched during the four week period from the end of May, the level of newt larvae predation would have dropped, allowing greater numbers to develop.

4.5 Evaluation and recommendations

Survey data from only one season does not provide sufficient information on the potential long-term survival of a species in a given area, especially when the weather during that period is considered unusually extreme. Cold April and May nights prevented earlier bottle trapping sessions. An earlier schedule of bottle trapping, ideally within a 10-14 day period next year, may provide a better estimation of the great crested newt population.

If it can be confirmed that water shrew are absent from the Long and Orchard Ponds, concurrent bottle trapping in those and the New Pond would more accurately indicate total great crested newt numbers on the site.

Torchlight surveys allowed a total head count of visible individuals (mainly newt species) on the site on any one evening, but it was not possible to record any movement between the ponds that may have occurred. The extremely high numbers of *daphnia sp* suggests that the Long Pond was an ideal feeding pond. The New Pond did not experience a *daphnia* bloom, but was well used for egg-laying. Further study of movement between ponds and whether or not they are primarily foraging, displaying or egg-laying sites would greatly enhance and inform any future management plan.

Despite the fact that the four ponds studied are surrounded by the buildings and hard landscaping of the Folly Farm Centre, the wider area provides habitat well suited to amphibians: mature, deciduous woodland, organic pasture, garden and dry stone walls all provide for their terrestrial phase. The evidence is that the cluster of ponds has at least been attractive to amphibians as breeding sites, even though 2010 proved not to be a particularly successful year. In order to optimise successful breeding, the ponds will need to be carefully managed to maintain diversity: they do not all need to be managed in the same way, nor with the same endpoint in mind (Biggs, 2010).

Traditional pond management practices tend to aim to stabilise the succession process at mid-succession stage (Griffiths, 1997) and this can be interpreted as cultivation rather than conservation of a habitat. Because of their small size, the Folly Farm ponds have succumbed to succession very rapidly and action is now necessary to prevent the Kitchen Pond, Long Pond and Orchard Pond from desiccating more frequently than not. All three of these ponds would benefit from radical clearance of the dominant aquatic vegetation, whilst avoiding the complete elimination of any species already present. Biggs (2010) recommends not attempting to change the pond's hydrology (eg by deepening a temporary pond to make it permanent). Occasional desiccation is a key factor for the success of the great crested newt population. As a dipping pond, the New Pond, will need to be 'cultivated' rather than 'conserved' and will therefore provide permanence for shorter lived species.

Whilst there is a degree of overlap in the requirements of the five amphibian species present on the Folly Farm Centre site, it would be neither possible nor practical to create a permanent, perfect habitat for all five species. Therefore, in order to maintain a degree of diversity, it is recommended that, where finance and manpower allow, the following points are included in any management plan :

1.As an alien invasive, all *Crassula helmsii* should be cleared from the Kitchen Pond and any other site where it occurs.
2.Dominant lesser pond sedge and reed canary grass will continue to choke the Long Pond if not cleared regularly. An initial removal of 90% of both species will reduce water loss and create more open areas for courtship.
3.The overflow pipe in the New Pond should be raised to allow the water level to rise as rainfall allows. Renewed efforts to build up the pond perimeter and the addition of more marginal plants will make amphibian ingress and egress easier.

5.Conclusion

The results of this survey suggest that the four ponds around the buildings of the Folly Farm Centre currently provide good breeding habitat for the three species of newt recorded there and the common frog. While the common toad did breed in the New Pond, the population is small and unlikely to be sustainable in the longer term at current levels. It is unclear whether the construction process had any impact on toad abundance. It appears that the newt population has remained buoyant and all three species have benefited from the New Pond. As they are a protected species, it is particularly important to monitor the site's suitability for great crested newts and an appropriate management plan can now be drawn up.

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Assessing the ecological quality and conservation value of ponds in South Gloucestereshire, with recommendations for their management.

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Editor's note. The original was illustrated with graphs, tables and photos that there has not been the space to include.

'The first little tadpole wriggling in your jam jar that miraculously turns into a frog'. Childhood memories of pond life that go back over 50 years, yet still capture my fascination today.
This research was undertaken in order to measure pond biodiversity value, ecological quality and to establish whether there was a relationship between environmental variables and species richness. The project also aimed to determine whether or not there was a relationship between abiotic and biotic variables and amphibian presence in the ponds. Existing land management practices were examined to see if they affected pond biodiversity value and recommendations were offered to land owners in order to improve biodiversity and prevent pond degradation. The project was undertaken with the support and advice from Pond Conservation and my data was included in their database. The project fulfilled some of the aims of the National Pond Monitoring Network to increase their information on pond ecological quality and conservation value.

Location of Ponds

The Bristol Environmental Record Centre kindly supplied me with maps of ponds that they wanted surveyed in South Gloucestershire extending through the parishes of Hawkesbury, Wickwar and Chipping Sodbury. Magpie Bottom pond in Hanham was also surveyed. Seventeen ponds containing water were surveyed. Fifteen degraded and extinct ponds were also studied.

The Nature of Ponds

Many definitions of ponds have been proposed based on various aspects of size, depth, water supply, geographical location, formation and water quality. Biggs et al (2005) define them as water-bodies between 0.0025ha and 2ha in area, which may be permanent or seasonal including man-made and natural ponds. I concentrated on permanent ponds, i.e. those containing water for more than four months a year. Ponds have a diverse history being formed from glaciation, land subsidence, river action and arising from natural springs. Anthropogenic activities, including water storage and mineral extraction, have created new ponds particularly in old quarries.

About 70% of the ponds the ponds that existed in 1880 have been lost. (Pond Conservation Trust et al, 2007). In 2007 the number of ponds in Great Britain was estimated to be 478,000. (Williams et al 2010). There was a high turnover of ponds between 1998 and 2007 with an estimated 18,000 ponds lost and 70,600 new ponds created. Overall the number of ponds in Britain is estimated to have increased by 1.4% per annum between 1990 and 1998. (Williams et al 2010). The millions of ponds that exist around the world represent 30% of global surface area of standing water. (www.europeanponds.org. 2008).

Pond loss and degradation are causd by a number of factors including changes in agricultural practices, invasion of exotic species of plants and animals, acid rain, pollution by nitrates, phosphates, and heavy metals, oils, the use of herbicides and pesticides, the infilling of ponds, and general lowering of water table (land reclamation and development) (Haslam and Sinker, 1982).

The History of Ponds

Ponds have been part of England's cultural heritage over many centuries and their existence has contributed to story and tradition. Many were made to provide water for drinking and washing, both for animals and humans. The 'ducking stool' on village ponds was one cultural feature used as a punishment. During the 17th Century, at the height of the witch hunting era, ponds were used to determine the guilt of witches.

Dewponds are another interesting type of pond, found on exposed chalk or limestone hills, they still retain their water even in the hottest summer. Most are lined by clay, e.g. the dew pond at Westonbirt National Arboretum. In the Middle Ages Monks also created large ponds called 'Stew Ponds' where they kept carp as a food resource for the monastery, e.g. Medieval Pond at Hawkesbury, South Gloucestershire (surveyed in this project).

Mill ponds also exist as important relics all over Britain. Some have been maintained or renovated to show another important contribution to village life in the Middle Ages. Ponds also had their uses in the days of horse and carts when a good soaking in the pond prevented the wooden wheels from shrinking and the metal tyres from pinging off, e.g. Drovers' Pond, Hawkesbury Upton.

The images of ponds have changed so much over the last 50 years from a useful asset in working life to an ornamental feature in village or countryside. Plenty of country folk still value them and in the 1970's a 'Save the Village Pond' campaign was launched and thousands were renovated (Beebee, 1992). The creation of garden ponds has now become fashionable in an attempt to replace the hundreds lost over the last centuries.

Importance of Ponds

Ponds are not only important for the numbers of species of aquatic plants and invertebrates that they support but also they are an intrinsic part of the landscape features. Ponds have been shown to contribute as much to regional biodiversity as rivers or lakes. (www.europeanponds.org. 2008).

Ponds are now included in the E.U. Habitats and Species Directive as a Priority Habitat (Pond Conservation et al, 2007). They are now a **U.K.** Priority Habitat and current data sets available suggest that 20% of the 400,000 ponds meet some of the criteria for being a Biodiversity Action Plan Priority Habitat.

Ponds support a considerable number of key species with at least 80 aquatic Red Data Book (RDB) species (Pond Conservation et al, 2007). Species with statutory protection include at least 65 U.K. Biodiversity Action Plan (BAP) Priority Species, e.g. Water Vole, *Arvicola terrestris*, and 28 animal and plant species listed under the Wildlife and Countryside Act (1981 as amended), Schedules 5 and 8. Also protected are six Habitats Directive Annexe II species, e.g. Great Crested Newt, *Triturus cristatus*, and White Clawed Crayfish, *Astacus pallipes.*
For example at Inglestone Common, South Gloucestershire, the temporary pond supports the local BAP species, Adder's-Tongue Spearwort, *Ranunculus ophioglossifolius.* The pond near Lance Coppice (South Gloucestershire) supports the RDB species, Tassel Stonewort, *Tolypella intricata* (local BAP).

The number of Red Data Book (RDB) species using the damp margins and drawdown zones of ponds (e.g. Diptera and ground beetles) has never been estimated but is likely to be considerable. Ponds are also an important feeding resource for bats and farmland birds.

Networks of ponds are vital to support the meta-populations of many aquatic species including amphibians (e.g. Great Crested Newt, *T. cristatus*), invertebrates and wetland plants (www.europeanponds.org, 2008). They often provide stepping stones between other freshwater habitats.

Ponds play an important role in education and research. Conservation of ponds offers the opportunity to explore and address some of man's current concerns of habitat destruction, species extinction, water resource management and climate change (www.european ponds.org. 2008).

Methodology

The method used to assess pond ecological quality was PSYM (Predictive System of Multimetrics) (Environment Agency and Pond Conservation 2002.) and was developed in response for the need of a standard that could be used by statutory bodies and consultants to determine the biological quality of still waters. Metrics are variables such as species richness or rarity which can be used to help identify the extent of pond damage. They have been shown to have a strong monotonic relationship with degradation. (Environment Agency and Pond Conservation Trust, 2002).

The procedure involves identifying plant and/or macroinvertebrate families from a site, sampled by using a standard method. These and basic environmental and location data are entered into a computer model which compares survey results with predicted values for a minimally impaired site to give an indication of pond quality (Pond Conservation Trust and Environment Agency, 2003).

Plant and animal communities are used because they span a complementary range of sensitivities to potential degradation factors. Plants are particularly sensitive to waterbody nutrient status, whereas animals typically exhibit greater oxygen sensitivity. Combining plant and animal groups give a range of taxa which span a number of trophic levels, occupy a variety of waterbody habitats (e.g. can be found in the littoral zone and open water) and are long lived, so that they can provide a temporally and spatially integrated measure of the current ecosystem state (Environment Agency and Pond Conservation Trust, 2002). Macroinvertebrates and macrophytes are the most effective taxa to use in pond surveys. Macroinvertebrates are identified to family level to reduce work effort and this has been shown to give comparable results to research using species-level metrics and degradation. Plant metrics are generally based on species level information (Environment Agency and Pond Conservation Trust, 2002). The PSYM method can only be used in the summer (June, July, August) with the most effective metrics for assessing pond degradation being:

Invertebrates;

- Average score per taxon
- Number of Dragonfly (*Odonata*) and Alderfly (*Megaloptera*) families
- Number of Beetles (*Coleoptera*) families

Plants

- Number of submerged and emergent plant species
- Trophic ranking score for aquatic and emergent plants
- Number of uncommon plant species

Environmental variables are also recorded as follows:

Altitude; Shade; Inflow; Percentage pond margin grazed;pH;Percentage emergent cover;Pond area.

Field Techniques

Marginal vegetation around the pond was recorded together with emergent, floating and submerged vegetation. The macroinvertebrates were sampled, based on the standard three minute hand net sampling method developed for the National Pond Survey and incorporated into the PSYM technique. The pond area may be divided into mesohabitats based on structural features, so that all main habitats may be included. One minute extra search time is allowed for searching under logs, stones etc. The macroinvertebrates were put in trays in pond water and identified in the field to family level. All plants and invertebrates were identified from Field Guides based on morphological features, habitat requirements, distribution and, in the case of invertebrates, movement.

RESULTS

Area and Species Richness

Data was extracted from the overall PSYM Analysis and results indicated that the number of emergent and submerged plant species increased with increased area of the pond. This is in line with the findings from Biggs et al (2005). Macroinvertebrate richness appeared to follow a similar trend in my study.

Relationship between pH and Macroinvertebrate Family Richness.

The ponds studied in my project exhibited a range of pH from 7.47 to 9.83 with clustering of macroinvertebrate richness around 7.5-8.5. Ponds with a higher pH still seemed to support some macroinvertebrate richness. All the ponds studied had the same geology of clay and Dyrham Clay (Geological Society of Great Britain, Solid Drift map), so it is not surprising that the pH was within that range. Differences in pH could be attributed to inflow/pollution.

Relationship between pH and Number of Aquatic and Emergent Uncommon Plants.

Four out of the five ponds with uncommon aquatic plants and emergent plants had a pH of around pH 7.50. One pond with a pH of 8.48 supported three uncommon species (one emergent and two aquatic).

There were two other ponds with pH around 7.50 that had no uncommon plant species, suggesting that a range of abiotic factors influence the presence of rare plant species and not only the pH.

The Impact of Shade on Plant Communities.

Raw data was analysed and the graph showed that there was a negative relationship between increased shade with a reduction in emergent and submerged plant species.

Amphibian Presence.
Ten out of the 17 ponds showed the presence of amphibians (Newts, Frogs or Toads) and these all had less than 65% shade. Amphibians are dependent on both vegetation and invertebrates for their life cycle and prefer ponds that are not too shaded. In my project they were found in all the priority ponds, ie ponds that score over 75% in PSYM analysis.

The Effect of Land Management on Pond Biodiversity Value.
I compared the plant species richness in ponds that were in farmed countryside with those found in countryside with no apparent source of pollution (minimally impaired ponds). Results showed that ponds in farmed countryside on average supported less than half the number of species found in minimally impaired ponds. These results are in line with those of Biggs et al 2005. My findings suggest that the farmed countryside ponds had become degraded either through pollution or inadequate management.

DISCUSSION

Relationship between Abiotic Variables and Species Richness.

1. Pond Area
My research shows that the importance of pond area for biodiversity is related not only to pond area, but also to the extent of the drawdown zone and the variety of mesohabitats within the ponds. A common characteristic of the ponds that supported rich macrophyte and invertebrate species was a large drawdown zone. This is the land area exposed between the winter water levels and the low summer level. Interim results from the National Pond Surveys suggested over 85% of wetland plants found in ponds grow in the drawdown zone and many are restricted to this area (Biggs et al, 1994). A water level drop of about half a metre in the summer months is usual for most natural ponds. Areas of bare, sparsely vegetated mud allow annual wetland plants to grow and the habitat is valuable for invertebrates, e.g. beetles, shore bugs and snails. Dragonflies like the Southern Hawker, *Aeshna cyanea*, often lay their eggs in the damp drawdown zone.
Although the ponds with a large area did often support a greater macrophyte richness, that was not always the case.

Biggs et al (2005) found that for emergent plants there was evidence of a positive relationship between pond area and the occurrence of uncommon species. My results did not show this relationship. I found that uncommon macrophytes were found in ponds that had been long established, undisturbed and never subject to pollution, e.g. the rare True Fox Sedge, *Carex vulpina*, was found in the drawdown zone in an undisturbed place. Uncommon macrophytes were also found in ponds subjected to small areas of grazing which opened up new habitats and removed competitive grasses, e.g. Tassel Stonewort, *T. intricata*, a rare submerged BAP species found in the poached areas of the pond.

The part of the pond most valuable for the biodiversity of invertebrates is usually the shallow water, 1-2cm deep. In six of the study ponds the greatest variety of invertebrates were found here. About 70% of the larger aquatic animals in a pond will usually be surface air breathers. This includes almost all beetles and water bugs and the majority of snails. Because of the ecological importance of the very shallow edge, great care is needed to ensure that it is not deepened or destroyed during pond management. Although the deeper area of a pond supports less diversity of invertebrates it is important for the establishment of Common Club Rush, *Schoenoplectus lacustris*. Open water is also needed for dragonflies and Great Crested Newts, *T. cristatus*, to display. Too much emergent vegetation can be a threat to the life cycle of the Common Blue Damselfly *Enallagma cyathigerum*, which favours open water habitats (Brooks, 1997).

2. The Effect of pH on Macroinvertebrate Richness

pH is another important abiotic factor and lakes and ponds show regional differences due to geology and hydrology of the catchment area, input of acidifying substances and productivity of the system. The National Pond Survey (1989) found that there was a strong relationship between pH and invertebrate species richness, with fewer invertebrate species in more acid waters (Nicolet et al, 2004). A similar relationship was apparent for aquatic (submerged) plants but not emergent plants. However neither plant nor invertebrate rarity was related to pH, suggesting that there are just as likely to be species of conservation concern in acid water as in base-rich water. (Williams et al, 1999).

Reduction in pH negatively affects the reproduction of many organisms including Crayfish, Daphnia, Molluscs, Insects and many fish species leading to a reduction in abundance of these species (Williams et al, 1999).

My research showed a clustering of macroinvertebrate richness around pH 7.5 to 8.5 and the presence of uncommon aquatic and emergent plant species in this range too. The study ponds exhibited a limited pH range suggesting that a selection of abiotic factors were probably responsible for the occurrence of species richness and rare plant species.

3. The Effect of Shade on Species Richness

There was a clear relationship between increased shade and the reduction in wetland plant species. The three heavily shaded ponds of 80%, 98% and 99% supported only three, four and no plant species respectively. However shady ponds do have a place in pond networks as they sometimes support unusual species. Wooded ponds have often existed for a long time and the conditions provided by decaying leaves or wooded surrounds are exploited by both aquatic animals and plants (Biggs et al, 1994).

Fallen branches and tree trunks provide habitats for aquatic invertebrates, and egg laying sites for dragonfly species such as Southern Hawker, *A. cyanea*, and the Brown Hawker, *A. grandis*. Wood is colonised by epiphytic algae and fungi which in turn provide a food resource for many invertebrates. Some aquatic fly and beetle larvae feed on decaying wood while leeches and other pond invertebrates can attach their cocoons and eggs to woody substrates (Biggs et al, 1994). Caddis fly, such as the common *Glyphotaelius pellucidus*, and more local *Trichostegia minor*, use leafy or woody detritus, including the bark for case building. I watched a Caddis Fly (*Phryganeidae*) attach pieces of leaf to its tube, a remarkable sight I shall never forget. Rotting leaves are also themselves a potential source of food for detritivores including the Freshwater Shrimp, *Gammarus pulex*, Mosquito larvae such as *Aedes rusticus* and the larvae of the Caddis Fly, *Limnephilus flavicornis*. I found Mosquito larvae (*Culicidae*) and the Phantom/Ghost midge (*Chaoboridae*) in many of the darker ponds.

The submerged roots of bankside trees provide a habitat for the crawling Water Beetles, *Haliplus* species, and Mayflies such as the Pond Olive Mayfly, *Cleon dipterum*, which I found in many of the ponds studied. The muddy edges of shady ponds can be an important habitat for the larvae of a wide variety of Dipteran families including Owl Midges, Craneflies, Snail-killing flies and Hoverflies. Woodland near to or surrounding ponds is also valuable to aquatic species, such as Water Beetles, *Helophorus dorsalis* and the Red Data Book species, *Agabus stridatus*, which are particularly characteristic of woodland pools (Friday, 1988).

A number of adult stages of aquatic and semi-aquatic insects prefer the sheltered environment offered by woodlands and dragonflies frequently hawk in woodland glades. Delicate-winged flies use this shady area where they are less likely to become desiccated. British native amphibians, except the Natterjack Toad *Bufo calamita*, prefer ponds surrounded by woodland and scrub (Biggs et al, 1994; Oldham et al, 2000). There was woodland and scrub close by all the ponds where I found newt, frog and toad tadpoles (Biggs et al, 1994; Oldham et al, 2000). Although few wetland plants tolerate very dense shade, a surprising number grow well in partial shade. These include emergents such as Yellow Iris, *Iris pseudacorus*, and Greater Tussock Sedge, *Carex paniculata*, and floating leaved species such as the aquatic liverwort, *Ricia fluitans*. I found Yellow Iris and Remote Sedge, *Carex remota*, in shady areas of the ponds.

Biggs et al (2005) found no difference in their shaded and unshaded ponds but, as they stated, the ponds were unimpaired and not very densely shaded. I think that the range of ponds that I studied gave a very good indication of the effect of shade on biodiversity across the whole range and was therefore very representative of this abiotic feature.

4. Vegetation Abundance

Biggs et al (2005) also found that greater vegetation cover was associated with more aquatic species. This was not necessarily the case in the ponds I studied. Two ponds with 75% and 85% cover had 33 species and 11 plant species respectively. However two others with a high percentage cover had few species, perhaps reflecting the fact that as the ponds were very overgrown there was competition for space and nutrients that limited colonization by other species. Other ponds with limited vegetation cover supported a number of different aquatic species due to large drawdown zones, providing a habitat for emergent species to grow.

The previous discussion shows that there is a relationship between abiotic variables and species richness and in my work those that were important were Pond Area and Drawdown Zone, pH, Shade and Vegetation Abundance. Although there were some exceptions to the correlations I think that this reflects the natural variation in pond ecology and the influence and interaction of the very many variables including competition and predation that go to make up the pond ecosystem.

The Relationship between Abiotic plus BioticVariables and Amphibian Presence.

Amphibian presence (Frogs, Newts, Toads) was found in all the priority ponds and associated with good macrophyte and macroinvertebrate richness as well as less shady ponds <65% shade.

The surrounding countryside was also important in providing shelter that enabled the animals to hide, forage or hibernate away from the pond. A tussocky sward created by cattle grazing provides an ideal habitat and woodland and scrub near the ponds provide refuges for them. One of the most important features especially for Great Crested Newts is a network of good quality ponds, as their survival depends on breeding between metapopulations.

In all the ponds I studied there was associated wood and scrub surrounding them as well as open meadowland or common land. One of the low quality ponds supporting newts had a particularly rich growth of the Floating Sweet Grass, *Glyceria fluitans*, which is a much favoured habitat and egg laying site for both Smooth and Great Crested Newts.

Natural succession is the most commonly perceived threat to Great Crested Newts as they like open water to display. Great Crested Newts were not found in one study pond that used to support them because of vegetational encroachment. Subsequent management in February 2009 created some clear water and they were found in July 2009. A very rewarding piece of management work.

Another threat to amphibian survival is the presence of large numbers of predatory waterfowl. The study ponds supporting lots of waterfowl, e.g. geese, did indeed have no amphibians. Those with a few ducks did. Amphibian tadpoles rely on microalgae for food that can, sometimes, be out-competed by filamentous green algae. Grazing by snails can reduce the latter allowing the smaller algae to flourish. This feature was apparent in one of the smaller ponds that had three species of snail and supported newts.

The results do show a definite relationship between pond quality, abiotic and biotic variables and amphibian presence. It was notable that the poor quality ponds had no amphibians recorded.

The Effect of Existing Land Management on Pond Biodiversity Value

Surrounding land has a big impact on the quality of ponds due to drainage from arable land or from polluting sources. The main pollutants are nutrients, such as phosphate and nitrate; heavy metals e.g. lead and copper and pesticides. The importance of catchment area has recently been recognised. The geology, hydrology, vegetation cover and drainage pattern of the surrounding area all affect pond quality.

Eutrophication is one of the biggest effects reducing pond ecological quality, caused by increased nutrient loading from phosphorous, e.g. human sewage or fertilizer run-off from agricultural land (Brönmark and Hansson, 1998). Several of the study ponds were either on agricultural land or by heavily grazed areas, and one had a cesspit running into it. Another had a big population of geese around it. Eutrophication can also be caused in ponds with high plant biomass and high productivity. The resulting dead material increases the nutrient rich sediment base in the pond, and nutrients leak out into the water. Eutrophication causes changes in invertebrate and macrophyte species richness and community structure. This allows organisms that can cope with the high nutrient loading to flourish, e.g. duckweed and algal blooms which then suppress other aquatic plants.
Some of the nutrient enriched study ponds supported Fennel Pondweed, *Potamogeton pectinatus*, Curled Pondweed, *P. crispus* and Fat Duckweed, *Lemna* gibba, which flourish in eutrophic ponds (Preston and Croft, 1998).

Invasion by Exotic Species.
Invasion by exotic species which out-compete aquatic plants is another cause of pond degradation. Parrot's-feather, *Myriophyllum aquaticum*, and Canadian Pondweed, *Elodea canadensis*, were found in two of the ponds.

Changing Hydrological Patterns.

An alteration in hydrological patterns has a very big impact on pond degradation. Of the 15 extinct ponds, eleven were dried out and overgrown with scrub. One group were below Hawkesbury Upton and I suspect were subject to alteration in their hydrological regime with the building of the village. One of the consistent features in the fields was the presence of water troughs supplying water for stock. Ponds had been fenced off from the grazing area and become overgrown. One had the water piped from a natural spring into the trough and away from the original pond. Other ponds had been filled in by farmers as they were in the way of ploughing!

It is apparent that current land management practices have a significant impact on pond biodiversity value and pollution is one of the most important factors limiting the nature conservation value of ponds. I found three main reasons for pond degradation in the study ponds. Firstly farmers no longer need to use them so they are fenced off, filled in or not grazed. Secondly changing hydrological regimes caused by urbanisation and redirected water flows and thirdly eutrophication and pollution from arable land and farm buildings.

Management Recommendations.

Recommendations are aimed at maintaining a pond that supports a high diversity of both plant and invertebrate species, as well as offering a range of mesohabitats. Unless actively managed, ponds will tend to natural succession becoming often choked by vegetation and silt. However, caution needs to be applied before dredging or pulling out vast swathes of plants. **Very high value ponds are frequently filled with a complex mosaic of submerged and emergent plants, e.g. an 83% Priority Pond in the study**. Plant species all have their own associated species of invertebrates, e.g. *Typha latifolia*, which is frequently removed, hosts a leaf-mining moth and Ruddy Darter (*Sympetrum sanguineum*) dragonflies are thought to be associated with the mud around its roots (Biggs et al, 1999; Brooks, 1997).

The richest group of pond plants are the emergents found in the shallow water and drawdown zone. The second group, aquatic plants which are usually submerged or floating, depend on good water quality for their survival. **Plants should only be removed for the following reasons:**

- Open water ≙25% needed for Great Crested Newts and dragonflies to display and egg lay
- Ponds were once grazed and where many of the important plant species required some level of disturbance to survive, e.g. Tassel Stonewort, *T. intricata* (Biggs et al, 1999).
- Silt build up should be controlled if conditions are particularly anaerobic and the pond unproductive.

Management Actions.

- Ensure pond is sited away from any polluting source
- Tree and scrub cut back if pond has become recently shaded, i.e. in last 5-20 years
- Retain large area of shallow water 1-2cm deep
- Have extensive drawdown zone
- Remove invasive species, e.g. Parrot's feather, *Myriophyllum aquaticum*, Water Fern, *Azolla filiculoides*, by raking.
- Remove excessive blanket weed using barley straw wrapped in gauze (old tights!) placed in small bales in the pond.
- Have willow trees around pond as fallen branches in water release tannin that helps control excessive algal build up (Williams et al, 1999). Also willow roots provide good underwater structure for amphibians and invertebrates to shelter
- Remove only ⅓ of vegetation per year in a pond in a wedge from deep to shallow.

The important point is that nearly all ponds have some ecological value and it is essential to retain a range of ponds at different **successional** stages as they support a different suite of organisms. The maintenance of pond networks within the landscape is vital. Biggs et al (2005) showed that connectedness between ponds was an important factor in plant and animal species richness. Temporary ponds are valuable too and should not be infilled as 75% support at least one uncommon species (local, nationally scarce or RDB) (Nicolet et al, 2004). The vital message for pond management is to proceed with care, with a good knowledge of the existing fauna, flora and history of the pond.

Million Ponds Project.

On a positive note, the U.K. Habitat Group for ponds has created the Million Ponds Project which aims to make about half a million new ponds. This will bring the total number of ponds back to around one million which was the number at the start of the 20th Century. South Gloucestershire Council has been asked by the Pond Conservation Trust to nominate top quality ponds, good areas for ponds and a few 'flagship' ponds. Hopefully, South Gloucestershire will be part of this wonderful opportunity to build up a regional mosaic of ecologically valuable ponds.

Finally, the wonderful variety of ponds and pond life that I have studied shows what a crucial part these still waters play in local and regional biodiversity. We should work to preserve them for future generations so that people may enjoy the miracles of life as they unfold from tiny egg to beautiful dragonfly.

Acknowledgements

My thanks go to Pascale Nicolet from Pond Conservation who gave me great support and encouragement and ran the PSYM field sheet data through the PSYM computer programme to give the pond conservation value. I could not have attempted the project without her help.

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I thank all the landowners who so generously talked to me and allowed me to survey their ponds.

Finally, none of this work would have been possible without the untiring and cheerful support of Rosemary Atkins who so kindly typed it all. My partner, John Coulson, has trudged over many fields with me and kept the cows from eating and trampling on my equipment while I was in the pond. Thank you, Johnny.

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Book Review

Whitebeams, Rowans and Service Trees of Britain and Ireland

BSBI handbook 14 by Tim Rich and Libby Houston isbn 978 0 001158 43 7

A superbly produced hardback which illustrates all 52 species that at present are known in the wild. Each species has three or more pages with leaf outlines, photos and distribution maps. The text gives measurement details of leaves and fruit, the history and conservation status of the species and its origins and ecology. No sorbus buff could want more.

The Introduction outlines the history of investigation of the sorbi, and the new DNA methodilogy used by Tim Rich to identify the plants found by Libby Houston.

There are 19 species in the Avon Gorge, and detailed consideration is given to the trees of the Cheddar Gorge and Wye vally as well as those of Devon, N Wales, Ireland, Arran island, Cumbria and Scotland.

There are detailed keys to the trees of each significant site including the Avon Gorge. There are guides to measuring leaves and the angles of veins, and careful descriptions of the fruit.

There may be many more species to be discovered because Sorbi don't just cross, they also regenerate apomictically. There is detailed discussion of the delicate issue of whether a particular type is a species or a hybrid, and there is much complex crossing between hybrids. Genetic analysis allows some insight into the origins of particular specimens. It is clear that in the Avon Gorge there is a group of hybrids between S Aria and S Torminalis and S Aucuparia

Mike Taylor 1925-2010

Born in Gloucestershire and educated at Chipping Sodbury Grammar School, Mike became an engineer with the BAC in 1945 and joined the BNS in 1947. He met Mary as a fellow BNS member, married her, and moved to Nailsea. He joined Imperial Tobacco and in the early sixties was heavily involved as a physicist in the development of the New Smoking Material, a non-addictive alternative to tobacco whose launch was wrecked by government taxation policy. He joined the BTO in 1954 and became part of its Scientific Advisory Committee, using his statistical abilities to develop the BTO Common Bird Census launched in 1962. This scheme which was the dominant method of assessing the density of common birds in woodland and farmland, from 1962 to 1994, and it demonstrated the steep decline in farmland birds from 1970 as a result of agricultural changes. Its success gave the BTO an influence with government departments that it has never lost. He was awarded the BTO's Tucker medal in 1971. He joined the BTO council in 1977, was Vice-President in 1980, and President 1982-4, the fiftieth anniversary year. He was an immensely skilled linguist, fluent in several languages, and in 1985 was appointed the BTO representative for the European Bird Atlas, an astonishingly bold enterprise which produced its massive tome in 1997, drawing together data on population size, distribution and change from every European country. This was perhaps his most significant contribution to national and international ornithology.

Locally he was hugely influential all his life. He was an early ringer when Chew Lake was filled, and he became one of the bird-wardens for the site. He was an enthusiastic supporter of survey work of all kinds, including Rookery surveys, and a contributor to the annual Fieldwork Reviews that appeared in the 1950s. He was a key part of the committee that wrote the annual Bird Report, and did it from 1966 until 1996, overseeing its change from being a few summary pages in the BNS Proceedings to becoming a 200 page booklet monitoring every species in the region. In 1967 there was a dispute about the amount of space allocated in the annual proceedings to the bird report, which led to some members leaving the BNS and founding the Bristol Ornithological Club. He was Secretary of the Ornithological Section from 1956 to 1969 and became President of the Society in 1970 and an Honorary Member in 1993. He continued to attend council almost to his death, and was a stickler for accuracy. He could spot a missing apostrophe at a hundred paces. His wide knowledge of local natural history, and his encyclopaedic memory of all BNS events in his lifetime was often of huge value.

He was involved in the organisation of the three BTO atlasses between 1967 and 1991. He was also for many years on the editorial Committee of the BNS Proceedings and helped to organise a series of special editions that came out in the 1990s.

He was a member of the Gloucestershire Wildlife Trust and as such in 1967 joined the management committee of Wetmoor Nature Reserve near Wickwar. This is an ancient Forest, site that is one of the most extensive areas of ancient woodland in Britain, which has been managed in the same way for at least the past 2000 years.

There was, in other words, almost no area of local natural history in which he was not in some way involved. He put his huge gifts to abundantly good use on both the national and local scale. He was always stimulating, always skilled at suggesting an original idea and finding the right person top pursue it. He will go down in the history of the BNS as one of its giants.

Anne Hollowell, 1929-2010

This obituary of Anne Hollowell (Honorary Member) is based on the eulogy delivered at her funeral by B.N.S. President Ann Wookey.

Anne Frances Hollowell was born in Hampstead, London on 30th December 1929. An only child, she attended King Edward's School, Golders Green. Her mother re-married whilst Anne was very young and they moved to Borneo where her stepfather ran a rubber plantation. It was here that Anne was educated at home by her mother. Anne's early life was further disrupted by the impending outbreak of the Second World War, and she and her mother were evacuated to Perth, Australia, leaving her stepfather behind in Borneo. He was later captured by the Japanese and held as a prisoner of war in Burma. Anne attended school in Perth and upon return to England enrolled at the Beltane School, Melksham. Tragically, although Anne's stepfather had survived the prison camp he died shortly after his return to England. Anne went on to further studies at St. Anne's College, Oxford where she took a degree in Zoology.

Anne had already met her future husband Adrian when he was teaching at Beltane School, but he did not see her again until a school reunion some years later. Their relationship blossomed and they married in Oxford on 16th August 1952. The birth of their son Nigel in the next year was followed two years later by their daughter Jennifer. Anne had taken time off work to raise her family but had taken a teaching course and worked at a school in Stroud, she then began her long career in the Bristol City Museum. Anne had at one time considered a career change and she qualified as a Chartered Secretary – something she kept up her sleeve just in case.

Ray Barnett, a former museum colleague, and now Collections Manager, recalls Anne's career in the following tribute:-

"Ann joined the City Museum and Art Gallery in 1962 as Assistant Schools Organiser (Biology). She would have taught visiting school groups and arranged self-led visits. She transferred over to be Assistant Curator and then later Curator of Natural History. During her time as Curator Anne saw considerable changes in the approach to museum work, for example, the move from rows of stuffed animals to show more life-like displays. One major highlight was the opening of the gallery showcasing the wildlife of the marine and freshwater habitats of South-west England. Opened in 1982 by David Attenborough (now Sir David) the gallery has stood the test of time with its creation of habitat dioramas based on real sites such as Chew Valley Lake. Also very important during her time at the Museum was the establishment in 1974 of the Bristol Regional Environmental Records Centre – or BRERC as it is known.

As a long-serving member of staff Anne is remembered with affection by many staff and others who served part of their apprenticeship and early careers working at the Museum. She is particularly remembered for her kindness and concern for the welfare of other members of staff. She played a key role in the Museum's Welfare and Social Group, helping to organise summer outings and Christmas parties, ensuring flowers were sent to sick members of staff and that retired staff were invited back to social events. Birthdays of immediate staff were always remembered with a card and even for some home made cakes. In the mid 1990s the Museum faced major staffing cuts and reorganisation and Anne took on the thankless task of union shop steward to again fight for staff issues. Throughout her long Museum career Anne retained close links with the Bristol Naturalists' Society whose Library is housed in the Museum building. Following retirement she remained a familiar figure in the Museum and Art gallery particularly when serving as Librarian for the Society.

Anne retired in 1995 at the age of 65 having given the Museum 33 years of loyal service, but Anne was not about to take things easy, and she promptly took on a new role as Curatorial Advisor to the Kingswood Heritage Museum in South Gloucestershire. As such she visited the Museum nearly every week to use the benefit of her experience to assist the entirely volunteer-run Museum in achieving professional standards as required by national schemes. Her help and advice was also appreciated by the South Gloucestershire Museums Group – meetings of which she never missed.

Anne's strongly held commitment to museums in general and to their role in the study and promotion of natural history in particular never wavered, and very recently she was attending public meetings concerned about plans reportedly to reduce investment and staffing at Bristo; support which helped to raise the profile and importance of our local museum and their collections. Anne's long service and constancy of support gave the impression that she would be around forever – sadly that is not the case but she will be sadly missed."

Peter Taplin of Unison recalls her much valued support for museum staff. After her retirement she helped to run the retirement association and always managed to arrange interesting speakers and to provide refreshments for their meetings.

In 1967 the Chairman of the Bristol Naturalists' Society Library Committee invited Anne, as a member of Bristol Museum staff, to sit on the Library Committee as a representative of the Museum. Anne remained a member of that committee for the next 40 years. Once Anne had retired from the Museum she looked for yet more challenges and in 1996 agreed to be co-opted by B.N.S. Council as Honorary Librarian and after being formally elected the following year remained in that role for the next 10 years.

In the Proceedings of the Bristol Naturalists' Society published in 2007 Roger Symes, a past President wrote "*An Appreciation of a Constant Librarian*." The success of the Library of the B.N.S. is due particularly to the voluntary efforts of a range of members who form the Library Committee. That Committee is guided by the Honorary Librarian, who is elected by members. At the Annual General Meeting in 2009 Anne Hollowell stood down as the Society's Honorary Librarian. The members of Council, the Library Committee and of the Society, wish to acclaim the contribution made by Mrs Hollowell as Librarian. Amongst Anne's other notable Society offices have been President, Honorary Editor of the Proceedings, and the election as an Honorary Member of the Society in 1991.

However, Anne wasn't satisfied with the librarian title for she had no library related qualification. Her genuine interest and enthusiasm spurred her to sign up for formal training and 2 years later gained a City and Guilds Library and Information assistant certificate. Even that was not enough for her and simultaneously she undertook a 2 days a week course resulting in the award of an M.A. degree in Information Services Management. More challenges beckoned and she attended practical classes over a period of 4 years for 1 day a week in practical craft skills level 2 – Book binding, Restoration and Preservation. Anne was able to put these new skills to good use and restored and beautifully rebound several volumes in our library. Anne's formal qualifications and training gained during her time as Hon. Librarian clearly benefitted the Society immensely.

They were however the icing on the cake since much of Anne's time and energy were devoted to physical effort in maintaining the library – even to sliding heavy bookcases around on reversed carpet tiles.

The society owes Anne a considerable debt of gratitude. As the B.N.S. was so much a part of her life her family requested all donations in memory of Anne to be given to the Society.

Pam Gooding, another B.N.S. member and long-standing friend of Anne's recalls the visit by bus with Ann to the Somerset Levels where Pam's daughter, a junior member, enjoyed pond dipping in the rhynes. Pam said Anne had a lot of knowledge and was a real all round naturalist. Speaking of buses takes me to Anne's constant bus travel. She would regularly take 2 buses to reach our council and lecture meetings whatever the weather and not until her later years did she accept a lift home. We often joked that Anne was a walking timetable. But my own favourite story of Anne is her lengthy journeys to look after her two grandchildren, Sven and Anja. For 6 years she travelled to their home in Sweden, often trying new routes and modes of travel (including coaches).

Anne was indeed a remarkable lady. Achiever, committed, dedicated, enthusiastic, hard working, kind, knowledgeable, loving, loyal, and tireless. These words spring from everything Anne was involved with and we are already realising what a great loss she is. Honorary membership of the B.N.S. is not easily attainable, Anne Hollowell deserved hers In most recent times Anne withdrew from active involvement in the society. She knew where she was now needed and that was at home caring for her husband Adrian. She died on 29th April 2010, aged 80. Sadly, her husband Adrian (also a B.N.S. member) also died 2 months later.

Trevor Silcocks 1931-2010

Trevor was an active birder in Bristol in the 1950s, one of a group of men excited by the ringing opportunbities created by the flooding of Chew Valley Lake, and inspired by Howard Davis. However in his late thirties he contracted MS, and spent the rest of his life confined to a wheelchair. Undaunted, he continued working for his accountancy firm for another twenty five years or so, tirelessly supported by his wife Margaret, and he continued to record the birds of the region, and to attend meetings. He specialised in a number of sites which were accessible by wheel-chair, including Ham Green Lake and the west bank of the Avon.

As he became more inactive he concentrated on recording the birds in his garden. He was a founder member of the BTO's Garden Birdwatch scheme in 1997, and sent records of the extraordinary number of birds he saw from his garden window in Abbotts Leigh every week until his death.

He faced the limitations imposed by his worsening condition with great stoicism and bravery, and refused to allow it to dominate his life. His contribution to both national and local ornithology was substantial, and he is much missed.

William Stanton 1930-2010

Willy Stanton was a hydro-geologist, brought up in Somerset, studied at Imperial College, and who worked for twenty years in Africa before returning to Bristol to work with Wessex Water and the River Avon water authority.
He was a brilliant speleologist, specialising in opening up caves that had become choked. He wrote important guides to the Mendip caves, and created innovative methods to improve access. He was a lifelong naturalist and a member of the Somerset Wildlife Trust, as well as the BNS.
He was an ardent polemicist for the Optimum Population Trust. His 2002 work, "The Rapid Growth of Human Population, 1750-2000", available in the BNS Library, was a graphic restatement of what every demographer has long known about the past 250 years, but he used the book to demonstrate that a catastrophe, both for humanity and the ecosphere, beckons, unless we move towards a population that can actually be sustained indefinitely into the future.
There can be no doubt that his analysis is correct, that Malthus was right all along, and that it is human population growth, not climate change, that will seal our fate unless we act promptly in a rational manner to reduce it. His analysis is widely understood to be correct, but there is no politician who has yet dared to espouse it. Perhaps, with the first Green MP in Westminster, he will come to be recognised as the visionary he was.

Recorders

One of the key aims of the Bristol Naturalists' Society is to maintain records of the Flora and Fauna of the region, and to ensure that these records reach the appropriate local and national bodies. This process has become vastly more efficient with the development of the web in the past few years, but it has also become more complex as a variety of organisations compete for records.
National Organisations involved in survey work include the British Trust for Ornithology, the Botanical Society of the British Isles, Butterfly Conservation, Mammalaction, the British Mycological Society

Locally The Bristol Environmental Record Centre (BRERC) www.brerc.org.uk collates and maps all records of all species, sends them on to the national NBN, and makes them available to all those who need them, and all recorde received from BNS members go on to BRERC. BRERC runs a series of Recording Groups; the Avon Reptile and Amphibian Group, The Avon Butterfly project, the Bristol Region Dragonfly Recording Scheme, The Bristol and District Moth Group, the Bristol and District Hoverfly Group.

Ornithologists are involved in both national and local survey work, and records of common birds should be sent electronically in excel to Richardbland@blueyonder.co.uk for includion in the Avon Bird Report. Rare bird records should be sent to John Martin at Avonbirdrecorder@googlemail.com
Plant records should be sent to pammillman2@yahoo.co.uk for inclusion in the annual Botany record. Rare plants in North Somerset are the responsibility of Helena Crouch at helenacrouch@sky.com and in South Gloucestershire of Clare and Mark Kitchen, markarkitchen@yahoo.com
Veteran Tree Records are being collected by the Woodland Trust at www.woodlandtrust.org.uk
Phenology records should be sent to www.naturescalendar.org.uk
Lichen records should be sent to David Hill at d.j.hill@bris.ac.uk
Insect, reptile and amphibian records should be sent to Ray Barnet at ray.barnett@bristol.gov.uk
Bat records should be sent to Bob West at recorder@avonbatgroup.org.uk
Mammal records direct to BRERC
Fungi and Slimemoulds are the preserve of Justin Smith at justin.smith@bristol.gov.uk or at home justinhongos@yahoo.co.uk
Mosses and Liverworts records should go to Nick Hudson at nick.hudson@hudec.co.uk
The Botany section have just established a Lower Plants Group which includes Ferns, Mosses, Lichens, and Horsetails. Details from Nick Hudson

Organisation

At the AGM on Saturday, 19th January 2008 the following elections were made:

Mrs A.M. Wookey	Society President
Mr N.J. Wray	Vive-president
Muston, Mr. R.	Honorary Secretary
Fay, Mr. S.L.	Honorary Treasurer
Wookey, Mrs. A.M.	Membership Secretary
Frost, Mr. D.W.B.	Circulation Secretary
Bland, Mr. R.L.	Editor of "Proceedings"
Davies, Mr. D.B.	Bulletin Editor
Leivers, Ms. M.	Publicity
Symes, Mr. R.G.	Ex President *(ex officio)*
Corner, Mr. T.	Liaison
Johnson, Mr. M.S.	Liaison
Taylor, Mr. S.M.	Archivist
Strawford, Mr. D.W.R	Editor of Society website
Wray, Mr. N.J.	Vice-president
Barnett, Mr. R.J.	President, Invertebrate Section *(ex officio)*
Cooper Ms. R.	Mammal Section *(ex officio)*
Drewitt, Mr. E.	Ornithology Section *(ex officio)*
Steer, Mr. R	Geology Section *(ex officio)*
Hilton, Mr. P.B.	Botanical Section *(ex officio)*
Smith, Mr. A.G.	President Botanical Section Invertebrate Section *(ex officio)*
Trump, Mr. D.P.C.	President, Mammal Section
Pocock Dr. M.	Council Member
Hollowell, Mrs. A.F.	Ex President *(ex officio)*

Society membership stands at 505.

Grants
The following grants were made during the last year.

To Fflyff McLaren who is writing a dissertation about the raised beach at Swallow Cliff near Weston-Super-Mare. This is a regionally important site that contains important evidence of ancient glaciation, sea-level change and cold-stage extra-glacial environments. It has been studied several times, but there is still uncertainty over the dating of these deposits. Council approved a grant of £270 to cover the cost of the thermoluminescent dating. It is hoped that an account of this study will appear in a future issue of Proceedings.Another Society member,

To Robert Buck who applied for a grant on behalf of the St. George's Flower Bank Local Nature Reserve. The reserve began in 1990 and received a Millennium Conservation Award in 2000, and funding has been found over the years to obtain necessary machinery, safety equipment and to pay for running costs. They are at present struggling to fund a professional to survey the invertebrates. Council approved a grant of £300. Robert Buck has kindly agreed to write an account of this worthwhile project in a forthcoming issue of Proceedings.

The Girl Guide Association were sent a contribution of £250 towards the installation of a hearing loop in the Guide Association Hall in Westmoreland Road, Redland.

Library
Mr J. Webster was elected as Honorary Librarian and also elected Chairman by the Library Committee. He wishes to express his thanks to all the active support and encouragement given to him throughout the year. In particular he would like to thank Mrs R Atkins for her hard work as Secretary, Mr R L Bland for his work on inputting titles into the computer, Mrs P Gooding for organising the successful Open Day, Mr R G Symes for his advice and historical knowledge about the BNS, and Mr B Tizard for his reviews of new books for the Bulletin. In addition, thanks to Mr R. Gooding for copying the glass slides into electronic form onto four CDs.

The members of the Committee staffed the Library almost continuously throughout the year from 12.30 - 1.30 p.m. on Wednesdays and from 10.15 a.m. to noon on Saturdays, despite the difficulties caused by the crowds attending the Banksy Exhibition. Thanks to the generous legacy of early first edition New Naturalist books by Miss Rogers, the books not required by the library were sold for £2,000, which was added to the library fund.

A number of changes occurred during the year such as holding the four Committee meetings in the Library itself, placing the New Naturalists books together as an attractive display and the re-organisation of the Geology books by Mr R Gooding.

Two workshops were held, firstly to clear the backlog of books requiring accession and secondly to create shelf space by removing, listing and packing some foreign journals. Further space was created by sending a run of old journals of the Belfast Naturalists Club dated from 1886 to 1938, which were gratefully received by their archivist.

Much thought was given by the Committee to the future development of the BNS Library and it was agreed that its greatest value to present members was as a lending library of up to date books on all aspects of Natural History and Geology, particularly in relation to the greater Bristol area. However it was also important to protect and encourage the research aspects that might not be readily available in other libraries. Mr R G Symes became archivist and it was agreed that the safe keeping of older historically valuable books should be a part of any future development of the Archive storage within the Library.

Looking to the future the Library Committee wishes to develop the BNS Library, particularly in anticipation of the 150-year celebration in 2012. A new computer is now required and in combination with a modern library software package will help drive changes and it is desirable to recruit new committee members to gain fresh ideas.

Mr J Webster wishes to thank the Museum Authorities for the continued use of the Library room and to thank the Museum reception staff for their unfailing help and assistance.

Archives

The contents of the archives cupboards in the Library have been reviewed during the year and the older items have been listed in a preliminary catalogue. A system of categorising items is being developed, together with suitable search words and descriptions of contents. Newer material (after about 1980) has still to be addressed. Notable items listed so far include Microscopical Society and Botanical Society minutes and other papers, as well as personal field notebooks of various members. The aim is to list all items, and to label and number them individually before any access can be permitted to them

Section Reports

Botany:
The botanical section held a sequence of 6 talks on a monthly basis over the winter period 2008-2009. In October, Chris Thorogood gave an outstanding talk about Parasitic Plants. The first half of the talk reviewed parasitic plants found throughout the world whilst the second half described his research on Orobanche which is the subject of his PhD thesis at Bristol University. Justin Smith followed on from his field meeting by talking about methods of identification of fungi and discussed their rarity, edibility and associated folklore. An assortment of members gave presentations at the post- Christmas meeting. In January, Mark and Clare Kitchen gave another excellent and well-illustrated talk entitled- a Miscellany of Gloucestershire Flora.

Nick Gray and Becca Bolam, on behalf of the local Wildlife Trusts, gave a presentation about the Biodiversity Stategies that were being pursued as a Living Landscape Initiative. This subsequently resulted in BNS members working with Avon Wildlife Trust in survey work to support this initiative. The Speakers programme was concluded with a talk by Russell Horsey from the Bristol Parks Department about management of the Council tree planting programme.

18 Field Meetings were arranged for the Botanical Section. Rob Randall and Helena Crouch (the joint North Somerset Vice-County Botanical Recorders) organised two meetings for us. A meeting in the Brecon Beacons was run jointly with Cardiff Naturalists. All other meetings were run by members of BNS. Generally meetings had very good support. Particularly large numbers attending the Dolebury Hill meeting run by David Hill and the Avon Gorge meeting led by Libby Houston to look at the summer flowers.

Geology:
In 2009 the Geological section had several interesting indoor meetings:
In January, the AGM was accompanied by a very interesting talk by Chris and Sue Townson. He told us about the fossil collections that they had made around Wotton-under-Edge. Mainly brachiopods, the specimens that they passed around revealed the variety available. In February Dr. Simon Braddy attempted to answer the question "Why were bugs big?" This involved tales of sea scorpions bigger than a man.
March brought us Dr. Tim Elliott, a talk about planetary geology and a visit from members of the Bristol Astronomical Society. All were fascinated to hear of this area of common interest. In April David Hardwick of the South Gloucestershire Mines Research Group gave us an insight into the mines – coal and other minerals – in the area. He also told us about the industrial archaeology of the remaining structures.

After the summer break, Isobel Geddes gave us a whirlwind tour of the prehistoric landscape of Wiltshire and the geology of the stone-built monuments.
November was the month that Dr. John Cunningham told us about his work on the Ediacara fossil embryos – tiny fossils – only one or so millimetres across, showing structures of the embryos of the very early lifeforms.
In addition to these meetings, we have had a good range of field meetings. We have a friendly relationship with the Bath GS, and several members attended Isobel Geddes' walk over the Wiltshire prehistoric landscape. Later in the summer, we also went with BGS for a fascinating walk among the southern Malverns.
Chris Townson also arranged a BNS walk, looking for fossils in the Alderley area – A very hot day, but very rewarding for all who attended.
We also visited the South Gloucestershire Mines Research Group's investigation and restoration of the Oldwood Pit at Rangeworthy. This took place on the group's open day, with tea and cakes available at bargain prices.

Invertebrates:
During 2009, 4 indoor and 6 field meetings were planned, however one of the latter was unfortunately cancelled due to heavy rain. At the AGM on 6th January Tony Smith and Ray Barnett were confirmed again in post as Hon. Secretary and President respectively. Indoor meetings covered local invertebrate species and sites but also broader topics such as the impact of climate change and an introduction to a new scheme for recording Earthworms. Officers and members also took part in the "BioBlitz" event at Ashton Court contributing many records of different species to the overall total. The officers thank all those who led meetings.

Ornithology:
In 2009 Ed Drewitt continued as President and Mary Hill as Secretary until she was replaced by Becky Coffin in September. There were 5 lecture meetings, 1 'members' evening' and 14 field meetings were planned but one was cancelled due to ice and snow. The meetings were reasonably well attended - the numbers at field meetings are always very weather dependant. We are very grateful to all our speakers and field meeting leaders.

Field Work.
In 2008, Members of the society were involved in the following national and local surveys:
Atlas: By the end of the second Atlas season 390 of 400 tetrads had been completed in the winter and 378 in the breeding season. Many observers also sent in Roving Records to add to the species list, and to prove breeding.
BBS: 120 observers surveyed 182 one-km squares.
Swifts: A survey of screaming Swifts was undertaken to seek to create an effective method of monitoring this species.

Birds in Gardens: 33 observers kept records of the birds in winter counting 32,200 birds of 51 species.
Overwintering warblers: Some 35 observers sent in detailed records of Blackcaps in their gardens.
There was also notable support for the Britrish Trust for Ornithology (BTO) Nest Record scheme, the Heronry census, and the Wetland Bird Survey.
Some observers contributed records via Birdtrack, the joint BTO & RSPB bird recording scheme designed to monitor the impact of climate change on migration. More are encouraged to do so, as Bird track records feed into the national atlas and are also downloaded for the Avon bird report.

Publications
The Proceedings for 2008 were published in the autumn of 2009. The Committee extends its thanks to the editors of both 'Nature in Avon' and the 'Avon Bird Report' for the excellent job performed. Papers in the Proceedings included commentary on the decline of the Lapwing as a breeding species, the discovery of a new species of fossil crocodile named in honour of Simon Carpenter, the trees of Tyntesfield and, unusually, the interaction between captive animals in Bristol Zoo Gardens and the native bird life (amongst others). The monthly Bulletin has continued to deliver up to date information on the business of the Society and on wildife observations, thanks to the editor for his constant efforts. On the website again regular updates have been a feature and increasingly new members are discovering the Society through surfing and coming across the website.

The Committee has met several times to discuss a special publication for 2012 celebrating the 150th anniversary of the Society and is indebted to Michael Pocock for leading ideas on the best approach to this idea. Discussion has also focussed on the importance of the web for future membership access and recruitment and ideas put forward as regards possible ways of upgrading our offer.

During the year, an e-group was set up. Whilst the general public may view the items, only society members may contribute and upload information. The group has been well used by a minority of members, and it would be good to see more of the membership joining in with the observations, discussions and comments.
An upgrading of the society website is in the course of active consideration by Council. It is hoped that there will be more to say in next year's report.

Publicity.
As always, particular emphasis was placed on the encouragement of new members. The Society publicised its meetings with its monthly bulletin. Posters announcing forthcoming meetings were produced on a regular basis and those and membership leaflets were displayed, particularly in libraries. The Society's website which was much appreciated by members and non-members, was also instrumental in publicising the Society.

In order to promote the Society's activities and to attract new members, stands were taken at various events including: the Bristol Festival of Nature in June, the Chew Valley Lake open day and the Rock and Fossil events in August, and the Wild Waters Family Fun Day in October.

Thanks
The society is grateful for the help and support received from the Earth Sciences Department of the University of Bristol, and to Mr Mark Moore, Headmaster of Clifton College for the use of their premises for meetings. Thanks are also due to Ms Kate Brindley for her continued support of the society library situated within the City Museum and Art Gallery. The society must also extend its thanks to those members who give so willingly of their time and energy to support the aims of the society.

Accounts 2009
RG Symes Acting Treasurer

BRISTOL NATURALISTS' SOCIETY

Statement of Financial Activities for the Year ended 31st December 2009.

	2009	2008
INCOME (Incoming Resources)		
Membership	6,961.00	7,257.50
Gift Aid	1,061.93	1,152.22
Bequests and Donations	2,705.31	1,515.53
Trading	187.78	113.88
Interest Received	379.20	2,037.66
Miscellaneous	0.00	53.50
INCOME Total	**11,295.22**	**12,130.29**

	2009	2008
EXPENDITURE		
(A) Direct Charitable Expenditure		
Meetings (Room Hire and Speaker Costs)	1,366.96	911.94
Books and Periodicals (Library)	616.05	658.95
Nature in Avon (Proceedings) Production	1,545.00	1,780.00
Avon Bird Report	1,750.00	1,440.00
Bulletin Production	1,396.30	1,450.65
White Sheet production	92.00	96.00
Publications Distribution Costs	1,235.40	1,126.06
Subscriptions to other Organisations	230.00	53.00
Publicity	280.68	133.83
Grants Awarded	450.00	1,935.00
Total (A)	**8,962.39**	**9,585.43**

(B) Administration		
Printing and Stationery	118.05	160.76
Postage and Telephone	329.12	147.43
Council Meetings	200.00	0.00
Library Equipment	0.00	406.55
Insurance	220.48	155.63
Miscellaneous	153.07	45.54
Total (B)	**1,020.72**	**915.91**
EXPENDITURE Total	**9,983.11**	**10,501.34**
Operating Surplus (Deficit)	**1,312.11**	**1,628.95**

BALANCE SHEET AS AT 31 DECEMBER 2009

	Notes	2009	2008
ASSETS			
Current Assets			
Pre-payments		513.83	629.95
National Savings		12,276.48	12,109.96
Bank (Lloyds TSB)		608.84	961.14
Bank (CAF)		36,081.15	33,698.48
Bank and Cash (Sections)		0.00	182.92
ASSETS - Total		**49,480.30**	**47,582.45**
Deposits not cleared banks		26.50	

LIABILITIES		
Creditors		
Subscriptions received in Advance	-160.50	299.50
Cheques (payments) not cleared banks	-397.91	
LIABILITIES - Total	**531.91**	**299.50**
TOTAL ASSETS LESS TOTAL LIABILITIES	**48,948.39**	**47,282.95**
CAPITAL		
General Fund	10,723.40	11,549.73
Designated Funds		
Milton	6,463.11	6,375.44
Memorial	17,218.82	17,096.73
Conservation	2,648.24	2,631.91
Library	4,660.44	2,632.80
Ornithological Special Fund	1,270.33	1,261.82
150th Anniversary Fund	150.68	
Restricted Funds		5,734.52
Hector Hockey	5,813.37	
CAPITAL - Total	**48,948.39**	**47,282.95**

Notes.

1. Pre-payments (for 2010/2011)

Insurance	£79.43
Room Hire	£330.00
Website Domain Name	£12.40
Periodical Subscriptions	£92.00
Total	**£513.83**

2. National Savings	**Hector Hockey Fund (Restricted)**	**Milton Fund**
Opening Balance	£5,734.52	£6,375.44
Interest Received	£78.85	£87.67
Closing Balance	**£5,813.37**	**£6,463.11**

3. CAF	**General Fund**	**Memorial Fund**	**Conservation Fund**	**Library Fund**	**Ornithology Special Fund**	**150th Fund**
Opening Balance	**£10,075.22**	**17096.73**	**2631.91**	**£2,632.80**	**1261.82**	**£0.00**
Interest Received	**£57.42**	**£102.09**	**£16.33**	**£27.64**	**£8.51**	**£0.68**
Bequest/ Donation	**£0.00**	**£20.00**	**£0.00**	**£2,000.00**	**£0.00**	**£150.00**
Closing Balance	**£10,132.64**	**£17,218.82**	**£2,648.24**	**£4,660.44**	**£1,270.33**	**£150.68**

4. Section	**Ornithology**
Opening Balance	**£182.92**
Net Expenditure	**£91.28**
Transferred to General Fund	**£91.64**
Closing Balance Account Closed	**£0.00**

5. General Fund

Opening Balance		
Bank (Lloyds TSB)	**£961.14**	
Bank (CAF)	**£10,075.22**	
Sections	**£182.92**	
Pre-payments	**£629.95**	
Creditors	**-£299.50**	**£11,549.73**
Closing Balance		
Bank (Lloyds TSB)	**£608.84**	
Bank (CAF)	**£10,132.64**	
Sections	**£0.00**	
Pre-payments	**£513.83**	
Debtors		
Uncleared deposit	**£26.50**	
Creditors		
Subscriptions in advance	**-£160.50**	
Uncleared cheques	**-£397.91**	**£10,723.40**
Movement		**-£826.33**

RG Symes, Acting Treasurer.

Instructions for authors

The editor welcomes original papers or short notes on the natural history of the greater Bristol region for consideration for publication in Nature in Avon All papers for consideration should reach the editor by the end of November for publication in the following year. All Society Reports and Biota should reach the editor by the end of February in the year of publication.

Whenever possible, text should be submitted electronically in Word. The data for graphs should be sent in Excel, separately from the graph, as graphs have to be recreated to fit the page size of the journal. Any other illustrations should be submitted electronically.

The Editor welcomes digital photos of any natural history subject taken in the region, whether relevant to an article or not. They should be of the largest pixel size possible. However as the number of colour illustrations is strictly limited he cannot promise to print any

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Rerum cognoscere causas - Virgil

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